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JMW Turner's (1775-1851) Watercolour Materials, Ideas and Techniques

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2001

17 MAY 2002

Abstract

Paul Clark: JMW Turner's (1775-1851) Watercolour Materials, Ideas and Techniques.
PhD 2001

Just as JMW Turner studied and absorbed the materials, ideas and techniques of the Old Masters in order to become a new one, so too I have done the same with Turner's watercolours in both local and national galleries as part of this thesis. In the same vein, I have been demonstrating how the practical skills of the artist, papermaker and colourmen came together to make the art work. This has entailed collaborating with a papermaker, materials scientists, chemist and conservator in order to make paper and paints like Turner's, based on original samples and colourmen/craftsmen recipes, to produce a series of comparative experiments and paintings using the said materials.

The papers, paints, gum binders and mediums Turner and other artists used in the 18th/19th centuries were very different to what are available on the market today. The consequences of this are outlined here. This is important because the materials, like the artist's skills, set limits to what can or cannot be done in the medium. Now they may be matched, duplicated and developed with a degree of precision and confidence unavailable before, recognising, as Turner did, that sometimes we have to take a step backwards in order to move forward.

Working under the banner of natural philosophy at Durham, I have been keen to demonstrate the advantages of considering art and science as creative pursuits rather than the product of tuition on the one hand or the mere gathering of facts on the other, and to provide the evidence of how one discipline can learn from the other.

During Turner's era the boundaries between artist, scientist, poet, craftsmen, among others, were extremely flexible. Here we can see how Turner blended their ideas with his imagination, materials and techniques to produce innovative watercolours.

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List of contents

		Page
Acknowledgements		iii
Chapter I	**Introduction: The luminous communion in a Turner watercolour** Why Turner's watercolours? Finding the structure of how things are made in order to understand them. The artist, papermaker and colourman. Turner scholarship and literature. Sketches but not the full picture.	1
Chapter II	**A life of ideas, places and techniques** The influence of the topographic, picturesque, sublime and the old masters, in particular Claude Lorrain, on Turner's watercolour practice.	27
Chapter III	**Seeing the light in Turner's watercolours – dissolving forms, fusing ideas** Art and natural philosophy as creative pursuits. Using Turner's watercolour *The Dark Rigi* (1842) as an example to elucidate how the papers and paints he used helped him to transmogrify ideas of light and colour in the watercolour medium.	62
Chapter IV	**Negotiating the labyrinth** How Turner's philosophy of practice, though at odds with the critics, connoisseurs and the splendid Theory of Art, enabled him to produce his watercolours at such a prolific rate.	97
Chapter V	**Turner, in his own words, on drawing and painting watercolours, including eyewitness and scholarly accounts** An in-depth exploration of his watercolour techniques and the effects of tools on style.	113
Chapter VI	**Making paper like Turner's** My own project with papermaker John Gerard to replicate the best in the papers Turner and other artists used in the first half of the nineteenth century. A brief history of papermaking, the handmade papermaking process, papermakers James Whatman, Bally Ellen and Steart, among others. Crucial differences between the papers Turner used and those available today. The uses of handmade and advanced technology – the Electron Scanning Microscope.	149

Chapter VII **Making watercolour paints like Turner's** 184
Some principal late eighteenth and nineteenth century colourmen recipes. My own experiments with gum binders, pigments and additives to match the paint films, textures and techniques in Turner's watercolours, using comparative studies and paintings. The uses and limits of advanced technology, the gas chromatographic mass spectrometry of Turner paint samples and my own experiments. The characteristics of different gums, arabic, cherry, tragacanth, karaya, sarcocolla and additives/plasticisers, honey, sugar candy, their preparation, ratios, performance in practice and influence on Turner's watercolour style.

Chapter VIII **Painting Turner watercolours – cracking the code of Turner's techniques in the medium** 261
A detailed step-by-step emulation of Turner's watercolour techniques in *The Dark Rigi* (1842), *Norham Castle* (1823) and *Campbells* series (1830s), among others. How theory went out of the window during the heat of practice. Includes observations and studies of Turner watercolours on display in various exhibitions, local and national collections.

Conclusion 299

List of illustrations

Bibliography

Acknowledgments

Professor David Knight, Department of Philosophy, University of Durham; John Gerard, Papermaker, Rheinbach-Hilberath, Germany; Peter Bower, Paper Historian Forensic Analyst, Tate Gallery, London; Gavin Robson, Senior Lecturer, Fine Art Department, Newcastle University; Dr John Gage, Head of History of Art, University of Cambridge; Bronwyn Ormsby, PhD research William Blake's gum and glue media, Northumbria University; Dr Joyce Townsend, Senior Conservation Scientist, Tate Gallery, London; Dr Colin Gill, John Smith, Mike Hern, Materials Science, Sunderland University; Ruth Trotter, Gallery Assistant, Laing Gallery, Newcastle and the Nivison Loan; Valerie Hunter, Print Room Assistant, National Galleries of Scotland; Dr Leslie Carlyle, Senior Conservation Scientist, Canadian Conservation Institute; Jo Kirby, Conservation Scientist, National Gallery, London; Dr Alec Campbell, Chemistry Department, Newcastle University; Dr Douglas Anderson, Chemistry Department, Edinburgh University and his wife Joan; Dr Efraim Lev, University of Ramat Gan, Israel; Derek Bradford, Bindery Department, Newcastle University.

Chapter I

Introduction:

The luminous communion in a Turner watercolour

Initial wonderment of Joseph Mallord William Turner's (1775-1851) art, indeed art in general, was sown during my childhood, seeing colour illustrations of Turner's works such as *Rocky Bay with Figures* (1830) (fig. 65) and *Crossing the Brook* (1815) (fig. 66). The latter picture to my mind was not too dissimilar in composition to John Constable's *The Cornfield* (1826) (fig. 67), of which a large copy was displayed in class at infant school.

These dark gloomy works, with their sunlit distances, matched in many ways the village landscape of Silksworth and Tunstall with its wild overgrown park and plantation. Here colossal trees with overhanging foliage formed arcades of long dark tunnels broken with shafts of light which illuminated ruined fountains and scattered broken masonry. At one end lay a recess of farmers' fields, forests and valley, surrounded in part by a hillside that swept round with a long walled city of red houses. Spaced between them, a distant haze led beyond the town to the coast which conjured its own 'Rocky Bay with Figures'. The entrance to this arcade was guarded by a labyrinthine complex of tall, dark and dangerous mining depots and deserted railway buildings with rows of empty black windows.

This landscape, seen through a kaleidoscope of different atmospheres, seasons and time of day, or transmogrified by memory and dreams at night, contained much the same elements as Turner, Claude Lorrain and Piranesi used to shape their own visions. Indeed I could find similar resonances in Giorgio de Chirico and Max Ernst's disturbing metaphysical and surreal works.

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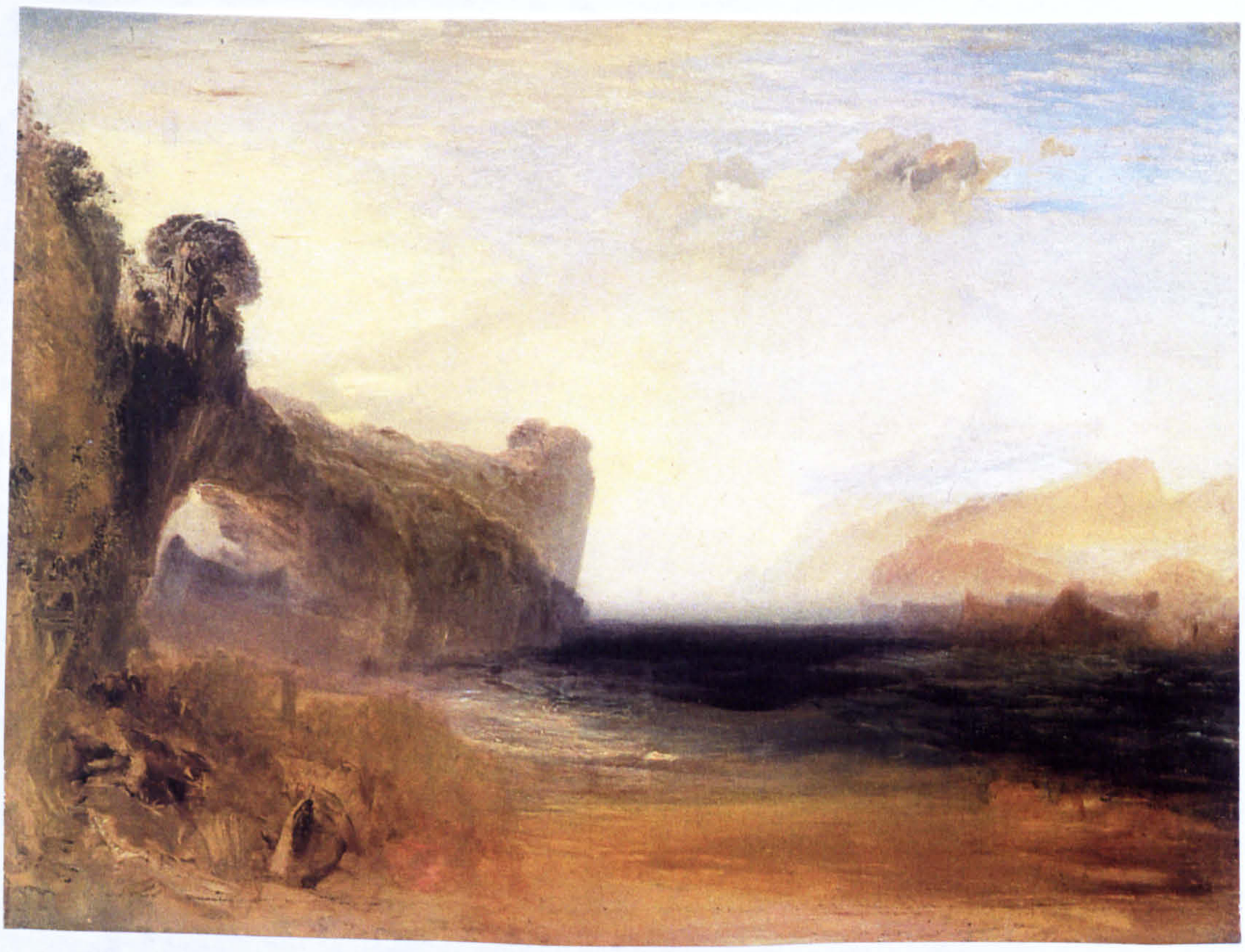

Fig. 65

Fig. 66

Fig. 67

Poets and scholars of classical antiquity referred to such lonely, isolated places that blend danger with the picturesque, conducive for attracting supernatural or mythical figures as locus amoenus. We all know such places – Turner certainly did around the Thames for one, and he knew they were not something peculiar to antiquity.

Certainly, classical poets or scholars have no more or less a complex understanding of such places as our own instincts and feelings can give us now. As the watercolourist and journalist William Henry Pyne (1769-1843) commented in the summer of 1833, "Nature is just the same now as when Turner began his artistical life and he who would be his equal or superior must study the same book wherein he discovered the principles which have elevated him to greatness".[1]

It is true that nature is just the same now as when Turner began his artistical life but the tools, paper and paints he employed to create his watercolours are certainly not, as we shall see.

It was during a college visit to the Tate Gallery, London, January 1982 that I examined for the first time a selection of Turner watercolours. The works, depicting coastal scenes of Dover etc. (approx. 16cm x 22cm), appeared far more intricate and luminous in their execution compared with contemporary watercolours I was familiar with at the time, including my own work.

After art college in 1985, I set about trying to find how Turner had produced such work in the watercolour medium. No one seemed to know; certainly many lecturers at art college and other institutions, I was surprised to find, considered him 'old hat' and irrelevant – they had no idea how he produced his watercolours or even

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[1] Arnold's *Magazine of the Fine Arts* (1833, cited in TS, Vol. 6, No. 1:24).

cared less. It appeared only the likes of John Gage (Cambridge University), Andrew Wilton (British Museum), Eric Shanes (Chelsea School of Art), among a few others, were able to see beyond this narrow focus and reveal a much more in-depth and interesting profile of Turner in their publications.

During secondary, tertiary and art school (1974-1985), accessible books on Turner's art ranged from small-scale studies such as Reynolds' *Turner* (1969) and Hermann's *Turner* (1975) to the broader Butlin and Jolls' two volumes illustrating *The Paintings of JMW Turner* (1977) and the more specialist Gowing's *Turner, Imagination and Reality* (1966), which attempted to link his work to twentieth century abstraction.

Titles more concerned with his watercolour art which I found helpful and inspirational were Gage's *Colour in Turner* (1969), with its exploration of Turner's practical colour theory, materials, lecture notes and inner meanings, symbolism and literary analogies in his painting.

Wilkinson's range of books (1972, 1974, 1975) provide a graphic insight into Turner's preliminary working methods, often using life-size reproductions of his pencil sketches and colour beginnings traced from his youth to mature practice. He also touches upon Turner's technical experiments in the watercolour medium, such as his use of extra gum in the paint "to give his medium more of a plastic quality associated with oil colour" (1975:14-18). Some of his illustrations (such as *Dover from Shakespeare's Cliff* (1825) (fig. 1), though wrongly titled in his 1975 fig. 18) fit hand in glove with Shanes' (1979, 1981, condensed 1990) publications. Shanes' books contain fine colour plates of Turner's finished watercolours commissioned for engravings series such as *Picturesque Views in England and Wales* and *Rivers, Harbours and Coasts*. He makes the odd reference to the techniques involved in their

Fig. 1

construction – a theme he explored further in his 1997 publications – concentrating more on their symbolism and content.

Wilton's explorations of the ideas and philosophies in Turner's practice, like Gage's, broadened my knowledge of Turner's interests and mental universe, in *Turner in the British Museum* (1975), *Turner and the Sublime* (1980), *Turner Abroad* (1982) and Wilton/Russell's *Turner in Switzerland* (1976), richly illustrated with colour beginnings and finished works. The last title included Turner's watercolour *The Dark Rigi* (1842) (fig. 2), among others in the *Swiss Series*. This work, which I was able to view in the Laing Gallery, Newcastle during the late 1980s and 1990s, would play a crucial part in my research.

During the late 1980s the following filled a gap after art college and encouraged my engagement with past ideas and techniques with present concerns in the watercolour medium.

Gage's *JMW Turner, A Wonderful Range of Mind* (1987), outlines Turner's interests which, in Gage's words, "shaped and directed his art", including his intellectual and physical activities, literature, friendships, tours, patronage and studies of the old masters. His chapter "Colour and Technique, The Role of Engraving" provides eyewitness accounts of Turner's post-1820s watercolour techniques, speculation and evidence on their influence, the three-colour theory, absorption of historical, poetic and scientific notions of colour, informed by theorists including Newton, Goethe, Brewster and old masters.

Gage's illustrations and supporting text to the *Norham Castle* (1823) watercolour (figs. 3 and 4) inspired further research into the techniques and materials involved in its construction, outlined herein. His contribution to *Turner, A Watershed in Watercolour* (1996), with its close-up illustration of *The Blue Rigi* (1842) (figs. 5

Fig. 2

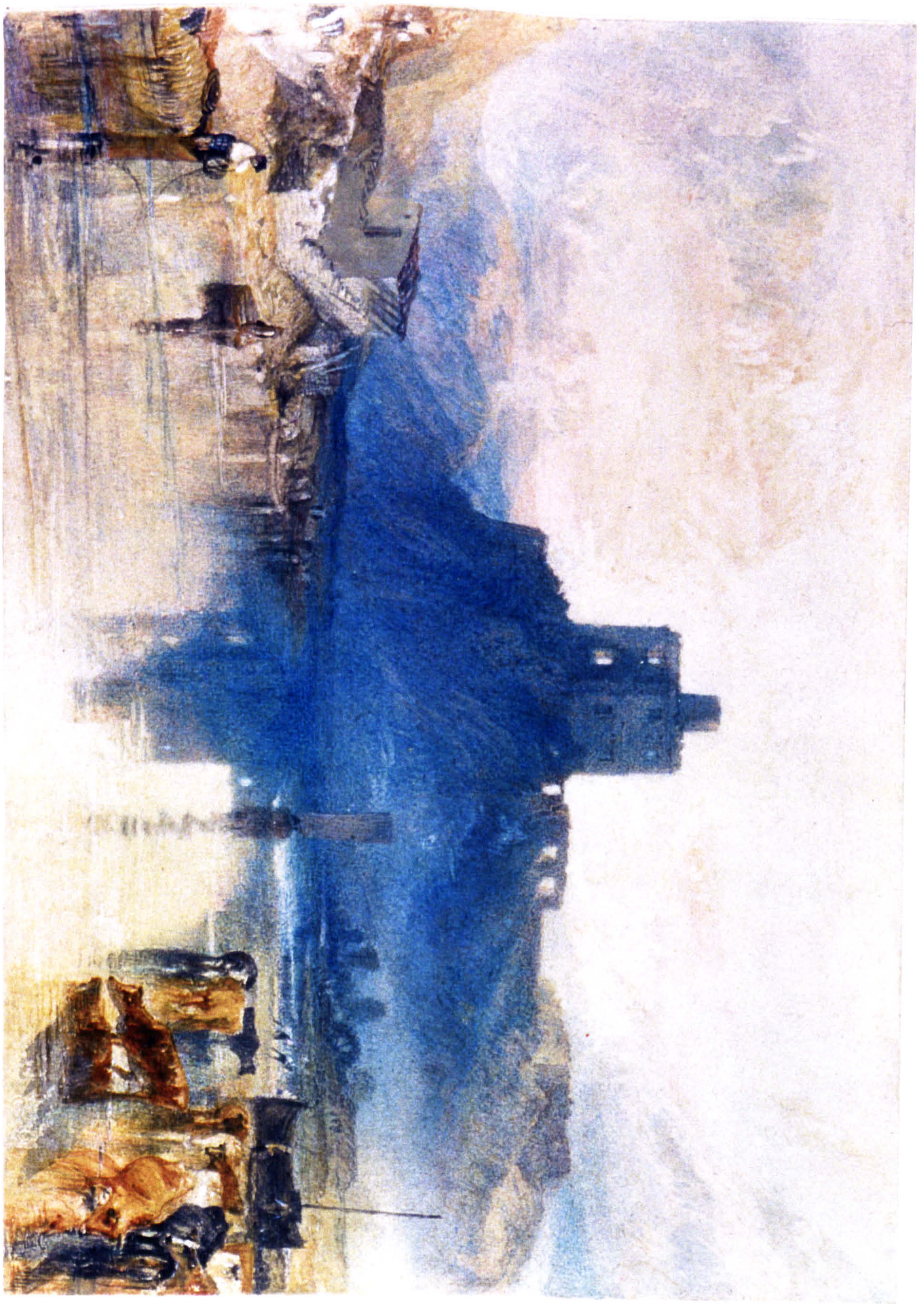

Fig. 3

Fig. 4

Fig. 5

and 6), sister to *The Dark Rigi*, provides one of the best reproductions of a Turner watercolour to date.

Powell's *Turner in the South* (1987) concentrated on the influence of Turner's Italian touring experiences of 1819 and 1828, using notes and drawings in his sketchbooks and reportage, providing further insight into his working practices and interest of old masters, particularly Claude Lorrain, whose footsteps he attempted to trace through the landscape, and crucially the effect of the Italian light on his developing a more prismatic watercolour palette, evident in *Florence* (1827) (figs. 7 and 8) and *Lake Albano* (1828) (figs. 9 and 10). The almost life-size frontispiece of *Lake Nemi* (1840) (fig. 11) and the preceding two illustrations are like Gage (ibid.), among the most vivid examples of Turner's watercolours published.

Very much in line with the above, incorporating chronological sequencing, supported with rich visual examples of sketches, colour beginnings and finished watercolours are Hills, *Through Turner's Footsteps in Yorkshire* (1984), *Through the Alps* (1992) and *In the North* (1996). Warrell's *Turner Through Switzerland* (1995) provides an excellent study of the preparatory watercolours used in that innovative series, including the *Rigis*.

Shanes' *Turner's Watercolour Explorations* (1997) and *Apollo* articles (November 1997) in some ways extend Wilkinson's line (ibid.) by explaining further the creative process behind Turner's watercolours. Shanes matches preparatory studies with actual sites and finished works, often with feats of remarkable detective work. Central to his thesis (see *Apollo*, ibid.) is an elucidation of Turner's tonal scale practice in the medium, which contributed to the luminous depth of tone he achieved in his watercolours. The Victorian painter WL Leitch's account of Turner at work provided the inspiration for Shanes' investigation into his tonal practice and

Fig. 6

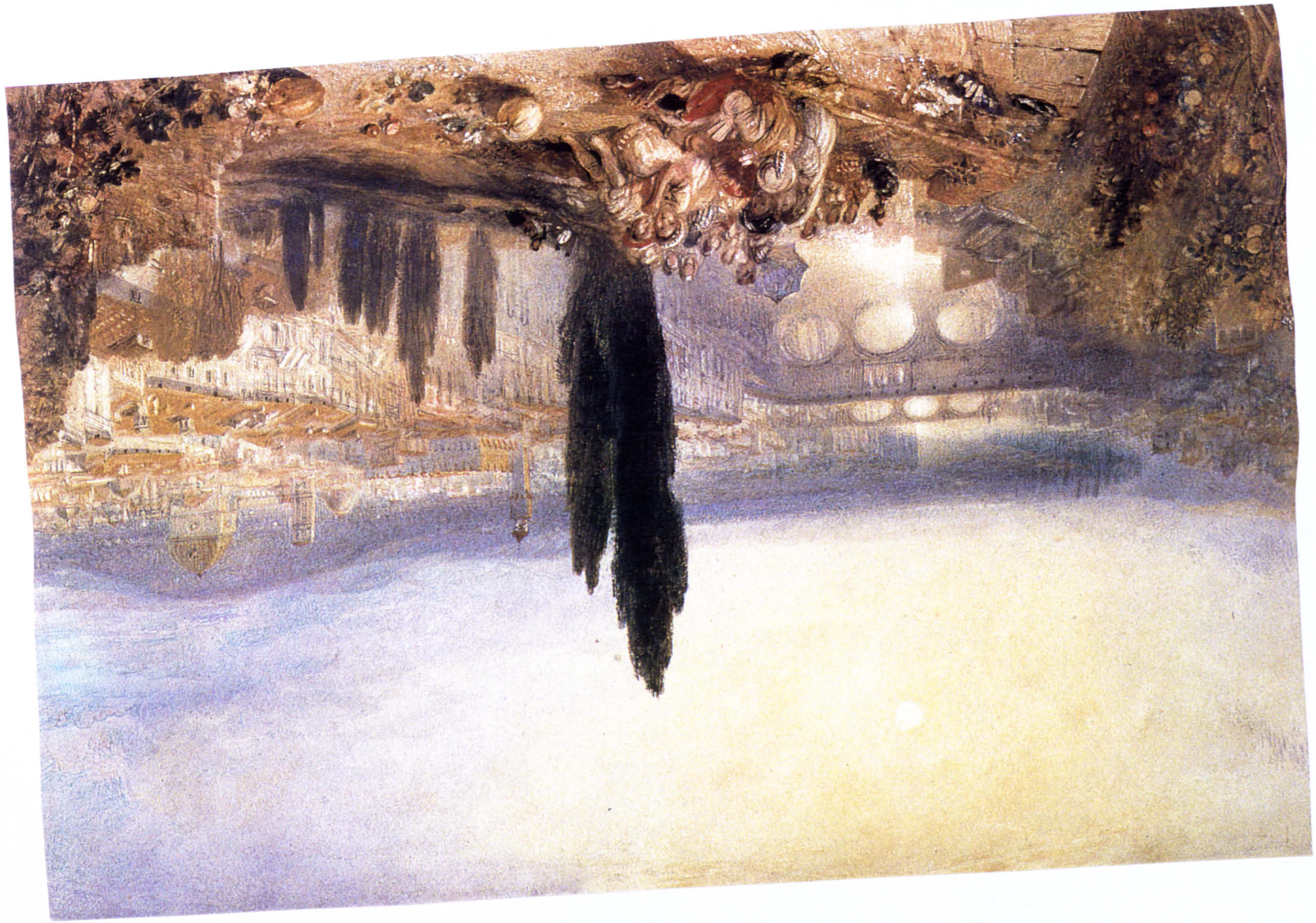

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

LW Pole's article in *Turner Society News* (I, 1995) "Turner's Watercolour Technique: A New Interpretation" in which he describes techniques whereby Turner achieved finely dissolving distances, chiefly by washing areas of dry watercolour until suitably faded.

Lindsay's important biography, *JMW Turner, His Life and Work* (1966) weaves Turner's lecture notes, book marginalia, poetry and other interests with his practical theory. He recognised that Turner was an experimentalist at heart and that this was crucial to understanding how he produced his innovative paintings.

Wilton's *Turner in His Time* (1987) is an updated biographical study, each chapter covering a decade in the artist's life, complete with studio inventory and list of contents in Turner's library. Wilton considered Turner's watercolours as the key to his whole life's work and that his creativity was not solely intellectually based but connected inherently to his emotions and feelings.

Both Hamilton and Bailey's recent biographies (1997) complement each other and incorporate a plethora of research found in *Turner Studies*, journals and *Turner Society News*. Whilst this thesis contains a brief biographical outline connected to Turner's watercolour practice, these two books provide a comprehensive starting point for anyone new to Turner. Bailey's book, like Hamilton's, is accurate and informative, capturing the atmosphere of Turner, almost film set material, whilst Hamilton appears more detailed, condensed and perhaps the most useful reference; he does not neglect the soul by which the facts are gelled.

The sheer scale of Turner's bequest provides a seemingly inexhaustible source for specialist interests, for example his European tours (Powell 1991), Brown's *Turner and Byron* (1992), Hamilton's *Turner and the Scientists* (1997), Sloan's *Lloyd Bequest* (1998), among numerous others. The separation of Turner's work into

distinct phases initiated by Ruskin can be found in Lyles (1989, 1992), Upstone (1989), Perkins (1990) and Warrell. However none of the above fully explain what makes Turner's watercolours work. Indeed, how Turner produced his watercolours and the effect of tools on style, i.e. paper and paints, received scant attention until the 1990s.

Thornbury's *The Life of JMW Turner RA* (1862, 1877) collated eyewitness accounts of Turner at work, many from people who knew him personally and were still alive when Thornbury collected his evidence. This work, criticised for its jumbled approach, nevertheless provides the primary source for other commentators. The material, technical information and eyewitness accounts such as Leitch's and Ruskin's, are reassessed herein. Ruskin, who also knew Turner for the last ten years of his life, is considered by many to be his greatest interpreter. They were friends and Ruskin's recollections are invaluable but Turner took intellectual analysis of his art with a pinch of salt. Ruskin's notes on Turner's watercolour style, practice and techniques are contained in *Elements of Drawing* (1857), which itself was triggered by Volume I of *Modern Painters* (1843) and the ensuing requests from the public for advice on drawing and watercolour painting.

A much neglected source is Barnard's *The Theory and Practice of Landscape Painting in Watercolour* (1858) – by a practising artist who had also met Turner. He provides a graphic description of how the papers and paints Turner used interacted to help create his innovative effects. Barnard also tentatively suggests the interweaving of light and scientific theory in Turner's watercolour practice, a theme explored by Gage (1969), Finley (1973) and Kemp (1992).

CF Bell (1901) also recognised the crucial role handmade papers played in Turner's practice. Finberg, a painter himself, showed a sensitive interest and

familiarity with Turner's working materials in his *Sketches and Drawings* (1910) and coherent biography (1939), yet surprisingly, as a painter, never commented on the possibility or impossibility of replicating Turner's techniques.

Hardie's (1966-1968) three volumes on *Watercolour Painting in Britain*, the most comprehensive survey to date on the subject, placed Turner's work in the medium in the context of his peers. Hardie provides information on their tricks, techniques and materials, including many of the gums, additives, mediums, papers and paints they used during the eighteenth and nineteenth centuries. Wilton/Lyles (1993) work explored much the same line and Cohn (1977) gives further background on materials.

Hardie's *The History and Techniques of the Great Masters: Turner* (1988) hardly deals with his watercolours at all, concentrating mainly on his oils.

Bower's pioneering publications *Turner's Papers* (1990) and *Turner's Later Papers* (1999), outline the specific characteristics of the handmade linen rag, gelatine sized papers he used. Bower traces their manufacture, development and working performance in Turner's hands. His work and advice have proved invaluable for my project with papermaker John Gerard (Germany), helping us to replicate the best in the papers Turner used in the watercolour medium (outlined in Chapter VI).

Townsend's book (1993) and articles centre around the analysis of Turner's paints, mediums and pigments he used as well as their technical application. Townsend's work served as an essential guide when I replicated Turner's watercolour paints, gouache and mediums described in Chapter VII.

A central claim of my thesis is that few if any scholars have studied the watercolours described herein in such close detail, to see how they work. In order to crack the code of Turner's techniques in the medium, which have remained largely

unfathomable for nearly 150 years, I have combined Turner's own words on the subject, eyewitness accounts of his working practice and scholarly interpretations with my own attempts at replicating his painting techniques using paper and paints based upon those Turner himself employed. This has been possible by employing the skills of papermaker John Gerard (Germany) and forensic paper analyst Peter Bower (himself engaged in an examination of Turner's works on paper in the Bequest), to produce a linen rag, gelatine sized, bleach free, handmade paper, based on a range of paper samples Turner used from the 1820s onwards (Whatman, Bally Ellen and Steart papers).

To progress with the above, it has been necessary to research the relevant aspects of the paper and paint-making processes, from the theoretical to the practical and has involved historical and scientific analysis, combining handmade and advanced technologies.

The main difficulties which have defeated or deterred many people in this area in the past twenty years or more are:-

(i) finding a papermaker with the skills to make such a paper;

(ii) finding suitable linen rags for papermaking pulp, free from bleach and optical brightening agents (OBAs), employed by detergent manufacturers to artificially brighten materials during the wash;

(iii) the effective gelatine sizing of the sheet, crucial for its ability to receive washes of paint without absorption, a salient characteristic of eighteenth and nineteenth century papers;

(iv) finding compatible pigments, paint recipes and gum mediums to those Turner and other watercolourists used in the eighteenth and early nineteenth centuries.

In Chapter VI I will outline the reasons behind my attempt at replicating the best in the papers Turner used. This includes my quest to find a suitable papermaker, Gerard; experiments to remove OBAs, resulting in a practical solution; how to make paper like Turner's, including a breakdown of the papermaking processes involved, the problems we encountered and their solutions; detailed experimental trials demonstrating how gelatine sizing becomes effective.

Since a central part of Turner's practice in the medium was dependent upon trial and error and word-of-mouth information, I have experimented with a whole range of pigments, paints, gum mediums, recipes and techniques in various combinations and ratios. Some of the above were suggested and collated by colourmen before, during and after Turner's era. Many artists including Turner would use commercial watercolour paints, modify them and make their own, using them singularly or in combination, as they saw fit. This obviously makes technical interpretation difficult, but not impossible.

Until recently there has been very little research into the components of watercolour paint from Turner's era, or any other era for that matter. The sampling of Turner's watercolour paint from the edges of his works and palettes, in order to find out their constituents and gum binders, has been possible by a joint Tate Gallery project with Bronwyn Ormsby (a PhD conservation student involved in gum analysis of William Blake's work, Northumbria University, School of Conservation) and Dr Joyce Townsend (Senior Conservation Scientist, Tate Gallery, London), using advanced technology such as chromatography and spectrometry. Some new and exciting discoveries from the above projects are outlined in Chapter VII.

The above, I believe, not only takes us closer to the vital charge of Turner's practice but also provides an insurance for the watercolours he bequeathed to the

nation. In addition opportunities are also here for further development of the said materials, with a view perhaps to a rejuvenation in the medium now.[2]

Just as Turner refused to restrict his range of ideas and techniques with unsuitable tools, neither did he allow academic or theoretical obstacles to hinder him. Although he absorbed intellectual, literary and scientific concepts, taught and lectured at the RA, any received ideas were tempered by his own practical concerns. For example he advised students to take inspiration from nature with all her complex causes and effects, for to study nature renewed your strength.[3] The sketchbook kept the memory bank stocked up with fresh experiences, images and your own imaginings to form a matrix from which invention could occur.

As we shall see in Chapter IV he considered this to be a far more productive pursuit than allowing yourself to be drawn into the labyrinth of the connoisseurs, critics or would-be men of taste, whose theoretical discourse and criticism was not only inclined to miss the heart of practice, but taught the student to view a production as the result of mere tuition instead of interest.

Wonder may be considered the seed of all knowledge[4] and Turner, like many innovators, believed it should be encouraged and nurtured, not killed before it had the

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[2] Dr Claire Barlow (Cambridge University, Engineering Department) is involved in a joint project to unlock the secrets of what makes a Stradivarius violin unique. Barlow also employs an SEM to examine the varnish, mineral and wood laminate on the violin to discover what effect they and age have, if any, on the sound, with a view to replicating the techniques in the present and developing some new technology for analysing sound (*Daily Telegraph*, Tuesday 21 January 1997). However Dr Bernard Richards, a physicist (Cardiff University) believes there are no secret methods, that the status of a Stradivarius owes much to snobbery; all violins are unique, the sound, being governed by the shape and treatment of the wood, affects the vibrational properties but, "if we would be allowed to continue Stradivarius' tradition of experimentation, maybe we could develop new sonorities and there's no reason why we shouldn't continue to develop the violin and there are people doing that" – for example, Ms Barlow.

[3] One of Turner's mentors, Sir Joshua Reynolds, commented, "he who recurs to nature, at every recurrence renews his strength", cited by George Barnard in *The Theory and Practice of Landscape Painting in Watercolours* (1858:4).

[4] Jonathan Smith, in *Fact and Feeling* (1994:260), cites Francis Bacon who, in *The Advancement of Learning* (1605), named 'wonder' as the seed of all knowledge.

chance to grow. He also likened genius to a seed which undoubtedly benefited from cultivation. He planted many such seeds and watched them grow into paintings - paintings which many a critic and connoisseur would still be trying to fathom out a century and a half later.

All seeds need light, and since light and its effects played a central role in Turner's watercolour art, the light reflectant properties of the papers and paints he used are of paramount importance. They became conductors and transmitters of his artistic vision and combined to produce the luminous effects and depth of tone that helped make his work unique.

Although Turner could produce a watercolour image on almost any paper surface, including lightweight machine-mades, he had his own preferences, and for sound reasons, as outlined in Chapter VI. Specifically they were handmade, linen rag, hard sized, smooth surfaced papers, originally designed as writing papers by Whatman, among others, to withstand the rigours of sharp metal pens on their surface.

Such papers were eminently useable for vigorous watercolour techniques, involving the layering of tint upon tint, scraping, rubbing and repeated soakings of water. Since they were well made and hard sized, their surface did not break up so easily and crisp, sharp details painted with the point of a brush would remain stable, not woolly or blurred when applied on top of these preliminary techniques.

Softer, spongier cotton-based papers are apt to break up and if ill-sized, they will absorb paint and light to produce a dull, lifeless effect to tints. Furthermore a badly formed paper, with large surface grains or a bland uniform machine-made texture can create a myriad of shadows in a tint. Since these shadows are close to the blue end of the spectrum, they will particularly contaminate and alter tints towards the red and yellow end of the spectrum.

CF Bell, in his introduction to *A List of the Works Contributed to Public Exhibitions by JMW Turner* (1901), noted,

> It will, perhaps, always remain doubtful whether ill-sized paper and feebly toned pigments were among the causes which contributed originally to the rise of the stained manner, but it is unquestionable that without the great improvements made towards the close of the eighteenth century and early nineteenth century in the manufacture of artists' materials, no such revolution as that which gave birth to modern water-colour art could have been carried through.

Two British School artists, John Opie and AW Callcott, in July 1805, found themselves both,

> Conversing on the singularity of Girtin's never being able to execute anything worth seeing 'till he got cartrage [sic] paper. O observed that painters were as much governed by their tools as their tools were by them seeming to consider that most of the art was dependent on the materials...[5]

The above applies as much to Turner as his youthful friend Thomas Girtin (1775-1802). A whole network of ideas and philosophies are contained in the tools he used and the techniques he employed; they have an intellectual complexity of their own. For example, not only do tools set limits to what can and cannot be achieved, their method of manufacture can embody and reflect economic and theoretical concerns of the age, or reactions to it.

This area has previously received little if any attention, though recently historians of science have begun to engage with the effects tools have on how theory building and meaning is made by experiments. Their work provides an example of

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[5] (Oxford, Ashmolean Musem MS AWC II a f. 338.) Gage, *George Field and his Circle* (1989:28).

how one discipline can learn from the activities of another.[6]

To understand, or rather interpret, a Turner watercolour such as *Norham Castle* (1823) or *The Dark Rigi* (1842) (figs. 3 and 2), it is necessary to look at what is involved in its construction; it is a multifaceted activity. An adequate account of the said watercolour cannot be developed solely from an analysis of the finished product but must include an analysis of the constructing process, the papermaker and colourmen's crafts who made the tools, their skills and perceptions lost from generation to generation, decreed obsolete today just like Turner's style of painting.

Recovering, deciphering and tensing this past knowledge in the present not only highlights the ideas and philosophies which governed what was and was not possible in Turner's era but crucially what is and is not possible today. On the face of it, this may be considered a paradox but paradoxes can signify serious problems and I will outline some of them in turn.

Reversals in technology

Turner's death in 1851 not only marked the year of the Great Exhibition and the beginning of formal art college education but, serendipitously, the demise of the handmade (according to consensus in the antique trade), with the acceleration of

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[6] See Gooding, Pinch, Schaffer, *The Uses of Experiment* (1989): Schaffer explores the crucial influence of the glass quality in Newton's prism experiments. Eds. Fauvel, Flood, Shortland, Wilson, *Let Newton Be* (1989) - an update of Newton's legacy and its connections with knowledge in the late twentieth century. Gooding, James, in (Michael) *Faraday Rediscovered* (1993), provides, among other examples, an in-depth look at Faraday's rotary motor experiments, the creative background and engagement with Nature's laboratory. Knight, *Humphry Davy, Science and Power* (1992), which inspired Oliver Sacks to comment, "Davy lived at a time when science and poetry were both seen as imaginative enterprises, complementary ways of exploring the natural world", a theme also explored in Johnson's *Birth of the Modern* (1991), whilst Miller *Insights of Genius* (1996) continues to explore parallels between imagery and creativity in science and art. Kemp *The Science of Art* (1992) engaged with tools' and instruments' influence on the transmission of messages between the world and human perception. Barrows, *The Artful Universe* (1996) and ed, Bourriau and Lamb's *Colour, Art and Science* (1997) updates ideas on colour science and light theory, making them more accessible to the non-expert.

standardised and mechanised mass production gaining momentum, not least with artist materials.[7] It prompted the writer, art critic and would-be champion of Turner, John Ruskin, to lament, "There doesn't seem anything which can't be made a little cheaper or quicker to the detriment of the finished product." Each technological approach has its own merits but the following example illustrates the tension which can exist between mass provision and quality.

The original handmade Whatman papers Turner used, with their own unique and particular characteristics (see Chapter VI), like many originals, tries to adapt by tailoring production towards the quality end of the market, or is absorbed as the machines of mass culture take it over and create a simulacrum of it, one with increasingly machine-made elements, and flood the market. The original still exists somewhere in archives or special collections but is no longer available in the mainstream market.

Asking why the papermaker's, colourmen's and crucially Turner's skills and perceptions were lost from generation to generation, or decreed obsolete today raises the deepest questions.

Why do such lapses occur? What makes an idea, a material, concept or

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[7] Martin Pollock, ed. *Common Denominators in Art and Science* (1981:110-111), states,

> There followed a desire for perfection, precision, clean-cut forms. The standardisation of occupations such as factory work led to a standardisation of other activities and amusements, and with mass-production quantities of standardised commodities were manufactured. Manufacturing concentrated on the principle of power, accuracy and economy. System, continuity, speed and repetition were developed and interpreted through studies of operation and machine development. The aim was to produce standardised products in continuous quantities – useful commodities of standard material and design at minimum cost. It was necessary to predict the conditions able to absorb a large production. Selling, propaganda and advertising techniques were therefore developed, and concerned with efficient financial organisation, management became scientific.
>
> The general conception of the division of labour, machine-assisted manufacture and assembly of standardised parts had already been established by the middle of the nineteenth century. In 1881 Frederick W Taylor had begun studies in the organisation of manufacturing by making stop-watch measurements of the time required to perform each step.

technique acceptable, useful or memorable? What may prevent it from being so, despite its clear importance and value? And, crucially, why can they take so long to identify and address?

Oliver Sacks in his chapter "Scotoma: Forgetting and Neglect in Science", *The Hidden Histories of Science* (1997:141-179) uses the term 'scotoma' (darkness/shadow) to describe such phenomena which in his field, neurological medicine, denotes a disconnection in perception, essentially a gap in consciousness, produced by a neurological lesion.

George Orwell would have called them historical or cultural "memory holes", the deletion of what was originally perceived, a loss of knowledge or insight, or a forgetting of insights and knowledge that once seemed clearly established but may lead to a regression of less perceptive or effective explanations.

Here, using materials Turner used as an example (see fig. 12), manufacturers such as Whatman and Winsor and Newton in the late twentieth century attempt to convince the consumer that the new product supersedes the previous one so an advancement and progression can take place, usually financially driven but, as we shall see, so can degeneration. However it is not only manufacturers who are engaged in convincing people of the illusions of progress. Eric Hobsbawm commented,

> The destruction of the past is one of the most characteristic and eerie phenomena of the late twentieth century. Most young men and women at the century's end grow up in a sort of permanent present lacking any organic relation to the public past of the times they live in.[8]

It may be considered an *avant-garde* gesture to reject the past but, as Sir Anthony Caro, sculptor, stated, "If today's generation took the trouble to look and

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[8] *The Age of Extremes: The Short Twentieth Century 1914-1991*, cited by R Appignanesi and C Garratt, *Postmodernism for Beginners* (1995:151, Icon).

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Fig. 12

learn, they would find themselves being surprised that someone centuries ago was doing the same thing they are".[9]

Jamie James said much the same in his book *The Music of the Spheres* (1995:8), today "the basic message to graduate students in science is that yesterday's 'misconceptions' are about as useful as yesterday's toast".

Today, art colleges are apt to consider Turner's style, techniques and materials as about as much use as yesterday's toast. They are out of step with the contemporary curriculum, deemed as obsolete as the papermakers' and colourmens' skills or the perceptions of natural philosophers such as Newton, Faraday or Davy. They all share something in common in that nowadays, their works are made to appear as if they had been produced "in a ready made text book form".[10]

The practical activities and processes which gave Turner's watercolours or the above works their existence seems to be either unproblematic or uninteresting, unlike the ideas and theories they generate. Art, not least Turner's, has become so sophisticated it is in danger of losing its purpose: "It is art for art's sake, it has lost its roots."[11]

> A picture is worth a thousand words. Vision is primary according to this view, and language secondary. But not any more – not at least in the visual arts, where the experience of the work is often meaningless without the critical text to support it.[12]

Concentrating on how Turner produced his watercolours will, I believe, help to take us closer to the activities which gave rise to them and help return his art to

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[9] *The Times* (7 February 1998:11).
[10] Gooding, James (1985:3).
[11] Here I echo the composer John Tavener's views on contemporary music, *The Sunday Times*, "Culture" (25 July 1999:2).
[12] Ashbee, Brian, *Art Review* (April 1999:51-53).

being a part of our everyday life rather than getting lost in an archaeological dig or "drifting further towards the consideration of images as texts".[13]

As Finberg recognised, "Works of art we find are something more than the fossil remains or dead bodies of artistic activity".[14]

Recovering, deciphering and tensing past knowledge in the present played a crucial role in Turner's practice. The blending of traditional and revolutionary concepts created a tension conducive for invention and creativity,[15] as Finberg noted:

> The rejuvenation of the traditional forms of art which we owe to Turner implied exceptional knowledge of the art of the past and exceptional experience of the claims of the present. This double knowledge could only be gained by a practising artist, by one who was daily using and testing his knowledge of the art of the past in the production of works addressed to the men of his own day. This familiarity with the traditional wisdom of his art could only be obtained by his own exertions – for the time had gone by when the body of practical wisdom was handed on in person from master to pupil.

And,

> It was only a workman like Turner, a master of the 'power and practicability of his Art', who could have developed the latent resources of his material, adapted them in unexpected ways to new uses, and given the art itself new life, new vigour, and new beauty.[16]

Whilst Turner was busy developing the latent resources of his materials and adapting them in new and unexpected ways, those who provided much of the theoretical discourse during his day often found their interpretations at odds with his practice.

The apostles of culture, journalists, writers, connoisseurs, critics, the Rev John Eagles (Blackwood Edinburgh Magazine, 1836), WM Thackeray, Sir George

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[13] TS Vol. 12 No 2 p2.
[14] Finberg (1910:153).
[15] The idea that invention and creativity may depend upon the tension between the forces of tradition and revolution is explored by L Hudson, in his article "The Question of Creativity" (see *Creativity*, 1978:288, Penguin Books).
[16] Finberg (1961:239-240).

Beaumont, and fellow artists such as Edward Dayes, Samuel Northcote, John Hoppner and Leigh Hunt, among other, were convinced Turner was a mental case.[17]

A typical example of hostility coming in the Literary Gazette in May 1842 which claimed his pictures, at least in the oil medium, were produced "as if by throwing handfuls of white, blue and red at the canvas, and letting what would stick, stick".[18]

Bailey believed that much of the hostility lay in the fact that Turner was no longer dedicated to eighteenth century clarity and precision; "he was beginning to pursue the unclear, the indefinite, the imprecise". "Turner had stopped trying to be an old master and was on his own terms seeking to be a new one."[19]

Just as we cannot rely on colourmen's recipe books to explain Turner's innovations in the watercolour medium, neither can we rely on the rigours of scholars, their texts or expert opinions, especially when passed through the filter and prism of their prejudices, as the above and following examples illustrate.[20] Today, as Ashbee noted (see f12), "the art world is teeming with professionals – curators, critics, journalists and many others – who are in the business of imposing their own narratives on the practice of artists, manipulating for their own ends, the primary product that artists produce".

Turner commentators and experts often attempt to capture him whole by concentrating on his own stylistic tendencies, his inner meaning, symbolism, literary allusion and analogies connected to his art, or any documentary source to which it can be shown he may have had access – Turner as the sublime realist, the literal painter,

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[17] See Falk (1938:166), (Finberg 1961:99, 279) and Hamilton (1997:161-162).
[18] Bailey (1997:347).
[19] Ibid. (p193).
[20] Gooding, James, *Faraday Rediscovered* (1985:9) states, "In the twentieth century most historians and philosophers have tended to project their preference for logically ordered theorising over empirical explorations of phenomena onto science."

the painter of the imagination, anticipator of impressionism, abstraction or empiricist translator – all are contended in a labyrinthine circuit of books talking to other books.

The fact is, many commentators have just sat and looked at his works and even those with access and a familiarity with his working materials did not concern themselves with the possibility of replicating or innovating upon his work in the present time, as Turner himself did after gazing in wonder at Claude Lorrain's oil paintings in the late 1790s. For after the initial shock, triggering a belief that he couldn't produce such works, he set himself the task of doing something about it.

Collating information about Turner's materials, techniques and concepts is all very well but testing ideas in practice is not only crucial to assess their viability, it is a central part of Turner's legacy few if any have chosen to pursue.

What connoisseurs, critics and the apostles of culture refer to as taste is the result of creative effort, not their analyses. In their hands it stops being painting and becomes something else, the consideration of images as texts. Texts which took longer to put together than it took Turner to paint the picture.

"He knows a great deal more about my pictures than I do. He puts things into my head and points out meanings in them I never intended."[21] Turner said of Ruskin, and even Ruskin noted in his diary, "he loved me but cared nothing for what I said, and was always trying to hinder me from writing because it gave great pain to his fellow artists".[22]

Ruskin's observations of Turner's watercolour techniques are invaluable; he had known Turner for the last ten years of his life but he was wont to attach "moral

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[21] Thornbury (1877:286 and 413) and Finberg (1961:232) echoed the same, stating Ruskin "could only 'interpret' the works he set out to defend and explain by reading into them his own passions for botany, geology and other branches of natural history and by imposing upon them the values of science and of his own narrow and wavering morality – things utterly abhorrent to the imaginative artist".
[22] Bailey (1997:348).

and spiritual significance to aspects of Turner's painting which were no more than instinctive gestures on the artist's part".[23] As Falk noted, "Many of Turner's effects, puzzling as they were to most of his fellow Academicians, were purely intuitive, and not at all professional fireworks, or tricks of the trade: 'I put in that effect because I felt it was necessary', he told a friend who could not understand certain passages".[24]

Imagination and intuitive instinct were threads entwined in Turner's practice; they guided him through a labyrinth of contrarities, fluctuating systems and the splendid Theory of Art, formed by the opinions of connoisseurs and critics who signified nothing to him. WH Auden's poem *The Labyrinth* echoed Turner's position:

> The centre that I cannot find
> Is known to my Unconscious Mind
> I have no reason to despair
> Because I am already there[25]

Great works of art, not least Turner's, are apt to be there already, inasmuch as the work is open to mystified readings, the artists having consciously or unconsciously anticipated the critic who remained forever a step behind.

The essence of practice is that it excludes such questions in the first place. When Turner painted a watercolour, it was instantaneous, like a violinist bowing, he just did it and did not have to reason it. To be overtly conscious of the skills, ideas and techniques he had absorbed in the heat of practice would have broken the spell and

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[23] Falk (1938:172).
[24] Ibid. (p161).
[25] Colin Wilson, *The Occult* (1986:148).

extinguished the spark which ignited the creative matrix.[26]

Thus Turner was "notoriously unwilling to explain such matters, doubtlessly concerned that the imaginative visual construct might wither in the face of a cold, formulaic enumeration. We must each puzzle it out".[27]

As Jean Cocteau said of the creative process, "My method is simple: not to bother about poetry. It must come of its own accord. Merely whispering its name frightens it away".[28]

Why do we like art? It is through our instincts not words that we often detect an unknowable, unfathomable presence when looking at a picture.

Perhaps it is for this reason Turner put more faith in visual demonstration than verbal instruction when teaching on a personal or professional level. Not only did a practical demonstration provide a clearer outline of his ideas, it encouraged students to look and think for themselves. For example, he demonstrated that even the rules of perspective were only a codification of what we learn by experience. Similarly he

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[26] Arthur Koestler, *The Act of Creation* (1964, Hutchinson and Co Ltd), explores the conscious and unconscious processes underlying scientific discovery and artistic originality, with an attempt to outline basic patterns they have in common. He defines the matrix in the following terms:

> The choice of the term 'matrix' is less easy to explain. In an earlier version, I used 'field' and 'framework' but 'field is too vague and 'frame' too rigid. 'Matrix' is derived from the Latin for womb and is figuratively used for any pattern or mould in which things are shaped and developed, or type is cast. Thus the exercise of a habit or skill is 'moulded' by its matrix. In mathematics, matrices are rectangular arrays of numbers capable of all sorts of magic; they can be subjected to various transformations without losing their identity – ie they are both 'flexible' and 'stable'. Also, matrices have a constant attached to them, called their 'determinant', which remains unaffected by any of these transformations. But the analogy between 'determinant' and 'code' is extremely loose and, in more than one respect, misleading. (p50)

[27] Jerrold Ziff review of Eric Shanes' *Turner's Human Landscape* (1990, TS Vol. 10 No. 1 p57).

[28] Arthur B Evans' *Jean Cocteau and His Films of Orphic Identity* (1977:120, Assoc Uni Press).

Continuing in the same vein as the above paragraphs, Wilhelm Dilthey in his *Descriptive Psychology and Historical Understanding* 1894 and 1910 reprint/trans (1977:5, 6, 30, 52) (Martinus Nighoff, The Hague) attempted to develop a new psychology based on lived experience to show it is real and that we need not regress behind it to find its source or justification. Essentially inner experience is already interconnected and therefore original. He was suspicious of thinkers who would impose order on it through artificial constructions and stated, "An empirical approach which refuses to base what occurs in the life of spirit on the understood nexus of human life is necessarily sterile. Through connections with psychic life, it acquires its power" (p30).

anticipated the codification of his own practice when he scribbled in his copy of Shee's *Elements of Art* (1809), his mentor Sir Joshua Reynolds' words, "One small essay written by a painter is more instructive than a thousand volumes of impossible practice".[29]

Once people can see how seemingly complex works of art are produced in the heat of practice, they can form a deeper understanding of the artist's work rather than approach it from the cold distance of textual analysis.

Recognising how Turner transmogrified ideas and techniques, often instantaneously, opens up opportunities for the enquirer to develop their own self-found knowledge by finding similarities in their own life experiences. For "works of art we find are something more than the fossil remains or dead bodies of artistic activity".[30] It is through our own activities and attempts at connecting experiences and knowledge meaningfully with the job in hand that illuminates their relevance, breathing life into the fossil remains or dead bodies of artistic activity, even concepts in dusty books. As Turner noted, an instructor may point out beauties and defects to a young artist but they are "neither one or the other to him without he prove to himself that they are so".[31]

Why should we be concerned with Turner's watercolour practice? Nearly one hundred and fifty years after his death, Turner's work in the watercolour medium still has a strong claim to remaining the benchmark by which others are measured. This was felt by many commentators during his lifetime and since, as the following testify.

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[29] Wilton (1987:81).
[30] Finberg (1910:153).
[31] Cited by Barry Venning (TS Vol. 2 No. 1 p39). Turner's notes written in Shee's *Elements of Art*

Professor Adam Hart Davis is engaged in a similar pursuit to the projects outlined herein, replicating and demonstrating scientific experiments and inventions with a view to inspiring students to develop their own ideas in his *Local Heroes* TV project, BBC, 201 Wood Lane, London W12 7IS, www.bbc.co.uk/education.

However no one fully pursued how Turner actually created such wonders in the medium, nor attempted to crack the code of his techniques, materials and style as a whole, by connecting his own words and deeds on the subject with the character of the tools he employed (paper and paints) and bringing it all to life by tensing it in the present.

It is not enough to believe Turner has exhausted all the possibilities in the medium as he himself initially felt Claude Lorrain's oil paintings had done when he saw them for the first time as a young man in the late 1790s. What is important is to find out how such works were created, as he did, absorbing what he saw fit into his own practice, with a view to preparing the groundwork from which further innovation may develop.

Gage (1987:2-3) noted that Turner's skills were still appreciated by some during his own lifetime. In 1808, the engraver John Landseer, in the longest and most important early assessment of Turner, spoke of the way in which Turner had raised the key of his pictures without using the usual techniques of tonal contrast: "he himself has been particularly successful in seeming to mingle light itself with his colours."

Fourteen to fifteen years later Robert Hunt, reviewing in *The Examiner* (3 February 1822) an exhibition at WB Cooke's in Soho Square, described,

> … a diffusive, lustrous, and mild light that shines into the mind, blending … power with gentleness… The wonder working Artist has produced this sweet effect by colour, almost independently of chiaroscuro, and by keeping the edges of the forms all tender. They hold a bland but luminous communion of light with each other, and with our minds…[32]

Hunt also reviewed Cooke's second exhibition (opening 1 January 1823) of

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[32] Bailey (1997:251).

Turner watercolours which included Rhine subjects, Osterspey, Neuwied, two views of Sussex (Pevensey Castle and Hurstmonceux), St Agatha's Abbey of the Richmondshire series and Dover Castle. All Turner's rich arrangements of colour, Hunt declared, were obtained by the use of,

> very little else besides yellow, grey and blue. Connected, blended, and sometimes delicately contrasted as these colours are … his effects are exquisitely tender, but not without sufficient force, from a certain magic arrangement, a graphic secret of his own; or rather from a correct and highly wrought sensibility. Such are 26, *Dover Castle*, 152, *St. Agatha's Abbey*, etc. The masses … are everywhere filled and enriched by a most firm-handed touching in of numerous shapes. The principle and practice … feed and satisfy the … imagination.[33]

A generation after his death, Hamerton (1879:374) stated,

> … no one has ever deserved such generally high rank as Turner in the art of water-colour painting. His superiority even goes so far that the art, in his hands, is like another art, a fresh discovery of his own. The colour, in his most delicate work, hardly seems to be laid on the paper by any means known to us, but suggests the idea of a vaporous deposit.

By World War II a whole range of different painterly styles and movements, broadly defined as modernism, had either been established or were in transition, yet Falk (1938:250) could still confidently declare, "As for Turner's watercolours, it is almost a platitude to speak of them as unchallenged, and unchallengeable. Here our British painter appears to have exhausted all the possibilities. What he has left us remains the last word in exquisite refinement of tones, as delicate as the draughtsmanship is superb".

1961 heralded a different era, not least in Turner studies, his work increasingly viewed as old hat in art colleges and by the new Apostles of Culture, yet it strangely remained unfathomable. Butlin (1961:12-28) not only believed, "The watercolours of

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[33] Finberg (1961:278).

JMW Turner are one of the greatest achievements in the history of English art"; he recognised technique and content as one, describing the *Mainz and Kastell* watercolour (1822) (figs. 13 and 14), stating,

> This work is also a fine example of the variety of touch used by Turner. The louring rain-cloud in the centre was painted while the paper was wet, the pink washes and touches of buff body-colour, drawn with the point of the brush, being added when the paper had dried. Conversely, the distant town shows the effect of using very dilute washes on dry paper. In the foreground the texture of the boats and surrounding water has been indicated by dragging relatively dry washes over the surface of the paper, while a line drawn by a wet brush through these washes has described a ripple on the smooth water; a similar use of washing-out produced the distant white sail and its reflection on the left. Another textural effect is that of the artist's finger-prints in the water above the rowing boat.

In the following chapters we will see how Turner "mingled light itself with his colours", "a mild light that shines into the mind" through "vaporous deposits" and rich arrangements of refined watercolour tones using "a graphic secret of his own" which was itself bound up with secrets contained in the tools he employed, papers and paints. They acted as conductors for the transmission of his imaginative, poetic and scientific ideas, whose "luminous communion" itself remained secret for nearly a century and a half.

Firstly, in order to situate the works referred to herein, I will outline the salient ideas and philosophies Turner absorbed during his life which influenced his watercolour practice.

Fig. 13

Fig. 14

Chapter II

A life of ideas, places and techniques

Turner was born and brought up in and around Maiden Lane, Covent Garden, London. Though Turner's childhood had periods of instability and sadness, it was not an unhappy one. His mother is reputed to have had an ungovernable temper - a trait some believe Turner inherited - and she suffered from bouts of nervous illness made worse by the death of his sister Mary Ann in 1786. His father, a barber, was by all accounts an easy going and chatty fellow. It appears both parents encouraged their son's artistic efforts; portraits of family members, scenes copied from books, buildings of London and so on were all proudly displayed in his father's barber shop, attracting positive comments and the odd financial reward.

Covent Garden, close to London's theatre land, was a bustling market, an area full of life, happenings and incidents and then nearer the Thames riverside. Here Turner would play, watching the ships, boats and characters in one of the busiest seaports in the world.[1]

Around the age of ten, due to a family illness, Turner stayed with his uncle Joe Marshall, a butcher, and aunt Mary in New Brentford - an area likened to the seat of paradise due to its pleasant landscape and gardens.[2] Here he attempted some of his early views and met his lifelong friend Henry Trimmer whilst attending John White's free school. A friend recalls him drawing cockerels and the like in chalk on walls as they idled their way to school[3] and it may have been there that the teacher relieved a boring lesson

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[1] See Barrie, citing Ruskin "The Two Boyhoods", *Modern Painters* (1987:576-585).
[2] Hamilton (1997:14).
[3] Finberg *The Life of JMW Turner* (Oxford 1939:14).

with the odd classical adventure story, possibly Virgil's Aeneid, which became a favourite of Turner's.

Whilst staying at New Brentford, a friend of his uncle's, John Lees, a distillery foreman, paid him two pence a time to hand tint with watercolour a topographic volume entitled *Picturesque Views of the Antiquities of England and Wales* by Henry Boswell, published 1786. Seventy plates were tinted by Turner and fifty-eight are of exactly the same subjects as Turner's own *Picturesque Views in England and Wales Series* which he completed between 1825-1838 (see figs. 18, 34 and 37).

Around 1786 he spent time with the Trimmer family at the seaside resort of Margate, producing more drawings at a place he would return to and remain ever fond of.

Turner, in common with the painter John Constable (1776-1837), the poet William Wordsworth (1770-1850) and the scientist Humphry Davy (1778-1829),[4] found that his childhood haunts would influence his later works. This assumption is based on the idea that the child has perceptions which are intuitive and when the man matures he draws upon these memories; on examining them, he finds that what they chiefly concern is the harmony of nature and man himself.[5] Formal schooling usually snuffs out the seeds of such perceptions[6] but Turner kept them intact and nurtured them. As Constable noted,

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[4] David Knight, in *Humphry Davy, Science and Power* (1996:15), cites Davy: "Learning naturally is a true pleasure: how unfortunate then it is that in most schools it is made a pain... After all, the way we are taught Latin and Greek does not much influence the important structure of our minds. I consider it fortunate that I was left much to myself when a child, and put upon no particular plan of study, and that I enjoyed much idleness while at Mr Compton's school. I perhaps owe to these circumstances the little talents that I have, and their peculiar application. What I am I have made myself; I say this without vanity, and in pure simplicity of heart." And Jonathan Smith, in *Fact and Feeling, Baconian Science and the Nineteenth Century Literary Imagination* (1994:77-78), University of Wisconsin Press, noted: "For Davy, nature was the inspiration and haunt of scientist, poet and artist alike. He recalled in a poem the influence of a favourite childhood haunt - 'a moonlit grove' - where he composed his 'earliest lays' and where his 'kindling spirit learned to trace, The mystic laws from whose high energy, The moving atoms, in eternal change, Still rise to animation."

[5] See Johnson *The Birth of the Modern* (1991:611).

[6] A point echoed by the philosopher Immanuel Kant (1724-1804); see Want/Klimowski *Kant for Beginners* (1996:9, Icon Books).

"my careless boyhood on the banks of the Stour, they made me a painter and I am grateful, that is I had often thought of pictures of them before I ever touched a pencil".[7]

Turner's boyhood days, spent around the misty Thames, Twickenham, the Margate seaside and the landscape about London, were to form the basis of some of the most impressive and innovative paintings ever produced. By his youth, he could transmogrify a commonplace, even bland view of the Thames into an epic scene from the Aeneid, with the immediacy and flicker of a slight pencil sketch (see fig. 15). To arrive at this stage and fix such visions, he knew he had to develop his technical skills, not least that central to his art, drawing.

Training in Architectural and Topographic Drawing

Thornbury reported that around the mid-to late-1780s, the print seller and engraver, JR Smith of Long Acre, employed Turner and another up-and-coming artist, Thomas Girtin; the latter two would become close friends. Ruskin believed Turner's first drawing master to be the wayward history painter Mauritius Lowe (1746-1793), however the first architect we know Turner worked with - in 1788, when around 12-13 years old - was the Neoclassicist Thomas Hardwick (1752-1829). Hardwick came to inform Turner's father, "that the boy was too clever and too imaginative to be tied down to a severe science". He recommended him to be sent as a student to the Royal Academy to become an artist,[8] which he did. Other architects who employed and taught Turner included James Wyatt (1746-1813) and Joseph Bonomi the Elder (1737-1808). In Turner's own words however, "my real master you know was Tom Malton of Long Acre".[9] Malton held an evening class in Conduit Street between 1783 and 1789, as did the brother

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[7] Johnson, ibid.
[8] Hamilton (1997:19).
[9] Thornbury (1877:27).

Fig. 15

artists, Thomas and Paul Sandby, which Turner also attended. Paul Sandby was not only a founder of the British watercolour school and the Royal Academy[10] but a skilled exponent of the use of transparent and opaque watercolour also known as bodycolour/gouache. However, Sandby never mixed the two mediums as exquisitely as Turner would come to do. As early as 1787 Turner was making copies of skilled watercolourists such as Michael Angelo Rooker and dated 1788, there are copies in the Bequest of Paul Sandby's work, and William Gilpin, whose influence on Turner will be examined in turn.[11]

Under the tutelage of the above, Turner developed a sense of accurate draughtsmanship and precision drawing - skills which would prove invaluable, especially when reconstructing his own imaginative subjects.

He learned how to work fast and effectively, taking advantage of the fact that most architecture is symmetrical, so when out sketching, he knew he could draw either half or part of the building whilst noting any points of interest, then move onto the next subject (see fig. 16).

The brief for the topographical artist was to produce drawings of historical landmarks, places, features and artefacts precisely as they are, devoid of any emotional or imaginative content, effects or atmosphere. These drawings were often reinforced with flat washes of watercolour, built up in broad, clean, unmodulated layers of monochromatic colour. This rendered them suitable for translation into engraved lines and tones which served as illustrations for book publishers who often commissioned them; Boswell's series being a prime example - a major source of income for artists during Turner's era.

In the summer of 1789, he stayed at his uncle Joseph and Mary's who had moved

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[10] Monkhouse (1879:15) and Wyllie (1905:16).
[11] Brown (1992:94-95).

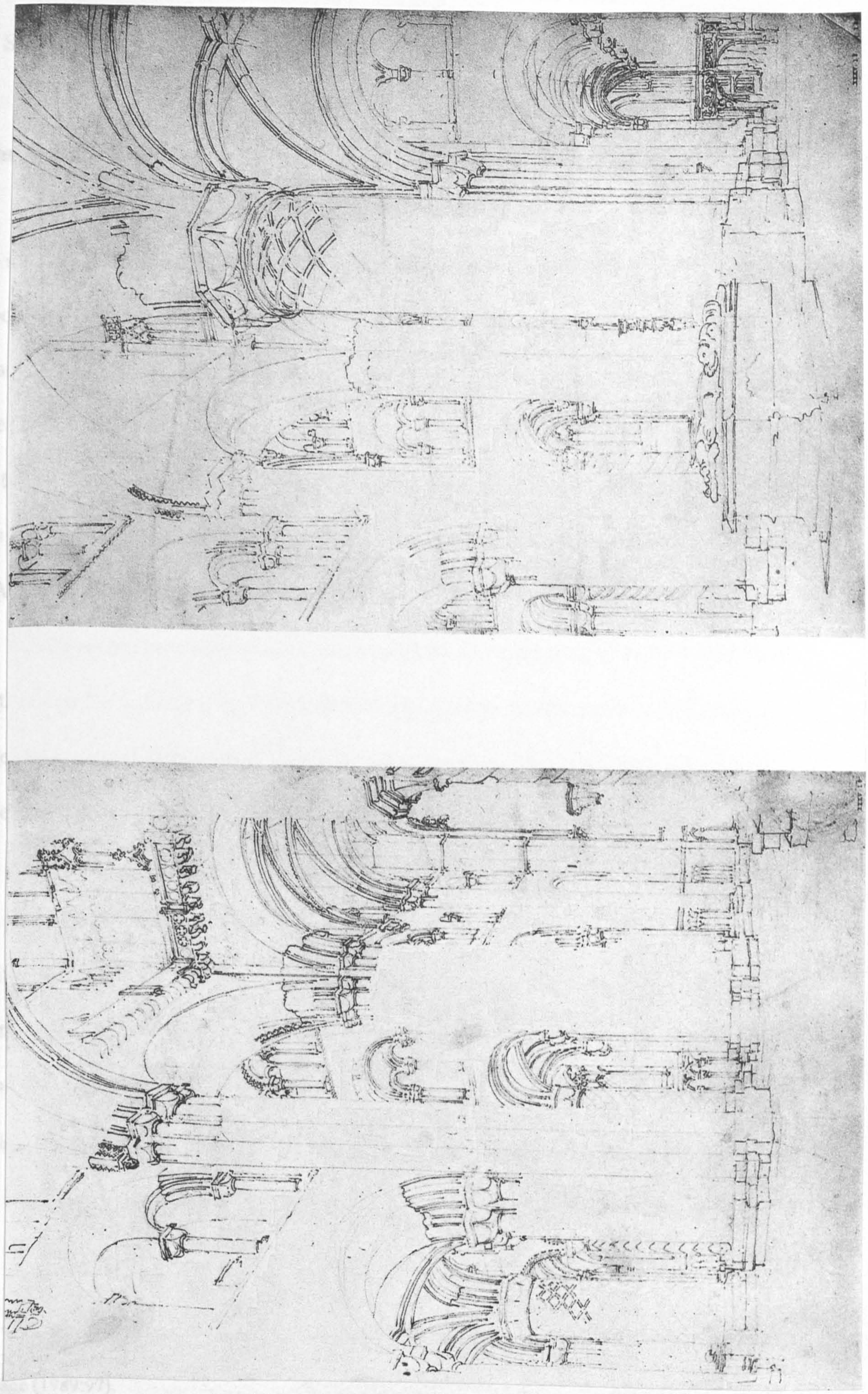

Fig. 16

to Sunningwell, near Oxford and kept a sketchbook of his visit.

The Royal Academy

In December of the same year, Turner was admitted to the Royal Academy. Here he studied painting, drawing, printmaking and etching techniques. A premium was placed upon working from plaster casts and life models, inspired by the renaissance ideal that man is the measure of all. Such study honed his line drawing skills and grounded him in the use of chiaroscuro - the articulation of light and shade which would prove invaluable to the development of his watercolour practice. He knew he was making progress when his watercolour of the Archbishop's palace, Lambeth, was accepted for exhibition at the RA the following year.

It was not only technical influences that he absorbed at the RA. Somerset House in the Strand also housed the Royal Society and Society of Antiquaries; here artists, scientists, natural philosophers and other innovators circulated and exchanged ideas freely.

The RA President, Sir Joshua Reynolds (1723-1792), though ready to retire due to his age and health, would leave a lasting impression on young Turner. He was, wrote an obiturist, along with Girtin, the only artist Turner cared to talk about.[12] Reynolds, in his lectures and *Discourses*, advised young artists not to submit to any one master and to consider, "that Nature herself is not to be too closely copied... but the artist must endeavour to improve upon Nature's disproportions and imperfections by the grandeur of his ideas; he must strive for fame by captivating the imagination"[13] and, for example,

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[12] Gage (1989:97).
[13] Eitner *Neo Classicism and Romanticism 1750-1850* (1971:36-38).

in the concluding paragraph of Discourse IV, he stated, "Study nature attentively but always with those masters in your company; consider them as models which you are to imitate and, at the same time, as rivals with whom you are to contend".[14]

Turner was already copying recent masters, especially watercolourists, in his teens and as we shall see, by the early 1800s he would become absorbed in the craft of old masters, in particular Claude Lorrain's (1604/5-1682) work.

The crucial point is that Turner studied masters in order to try and discover the methods by which their paintings were put together and to capture the spirit that lay behind his favourite works in order to hopefully go one better.

The picturesque and sublime - ideas to facilitate picture making

One central picture making idea Turner had been aware of since he had tinted Boswell's series of prints as a boy was the notion of the 'picturesque'. During the eighteenth century, the term 'picturesque' came to mean any subject suitable for painting or that which constitutes a picture. It was chiefly concerned with ideas and devices for creating and composing harmony out of nature's disorder on one hand, or celebrating its wild and unsettling aspect on the other - the latter swinging more towards the 'sublime' which we will look at in turn. The idea had its roots in Classical Antiquity, a locus amoenus, a place of peace, tranquillity and mystery, the search for which became a preoccupation with many British artists in the eighteenth and nineteenth centuries, not least Turner.

One of the chief exponents of the picturesque during the eighteenth century was the traveller, Parson and amateur artist William Gilpin (1724-1804) who wrote eight volumes on the subject describing tours in Britain in search of picturesque scenery. Going

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[14] Gage (1987:98).

on a tour to hunt for spectacular scenery was a picturesque pursuit which Turner was already undertaking with relish by his early teens. Among nine of Turner's earliest drawings, dating from 1787, were two copies from Gilpin's *Observations Relative Chiefly to Picturesque Beauty [in the] Mountains and Lakes of Cumberland and Westmoreland* (1786).[15]

Another artist, Alexander Cozens (1717-1786), in his book *The Various Species of Landscape and Nature* (1771), proposed a list of subjects that the artist may consider in order to achieve picturesque effects: "A track, road, path or river valley proceeding forward from the eye. A single object, or cluster of objects, at a distance may serve as the principal subject matter for a picture."[16] Viewed "before sunrise, rising sun, fore-noon, noon and afternoon", the subject would take on specific atmospheric qualities. In addition, the painter, taking advantage of the above diurnal sequences, can trigger a whole range of emotional states of mind in the viewer from tranquillity, attention, caution, awe, expectation, to fear and terror"[17] through the careful manipulation of atmosphere and effect.

In the same vein, Gilpin, in one treatise, advised taking a tint from the sky to achieve a harmonic tonal mood - and hopefully an emotional response from the viewer - no doubt inspired by Poussin's system revolving around the Diatonic modes of Greek music. He states, "the whole of a picture under the regulation of one master-tint or key tone which, in landscape, I think should always be taken from the ethereal or unclouded part of the sky, whatsoever colour this inclines to, whether greenish, greyish or purplish, the whole picture must partake of it".[18]

The above subjects suffused Turner's watercolour works throughout his career.

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[15] TS Vol. 2:5.
[16] Wilton/Lyles (1993:36-37).
[17] Ibid.
[18] Gage (1969:56).

For example, *Norham Castle*, both the 1798 and 1823 versions (figs. 17 and 13) and *Prudhoe Castle* 1825 (fig. 18) - among others in the *Picturesque Views of England and Wales* series (1825-1838) - are single objects, ruined castles and abbeys, proceeding forward from the eye at the end of a river, set against a brightly illumined sky,[19] the lightest tint permeating the picture.

In 1774, Gilpin mused as he surveyed the picturesque remains of formerly prosperous Winchelsea, "The painter gains from what the merchant has lost".[20]

The British landscape during Turner's era had its fair share of picturesque ruins - relics of previous ages were still evident, just as the ruins of the Roman Empire could be seen by Claude and Poussin in seventeenth-century Italy. For Turner, the abbeys ruined by Henry VIII, the castles wrecked in the English Civil War and the casualties of economic transition provided rich subject matter for many of his watercolours (see figs. 3, 18 and 125).

Gilpin's *Observations on the River Wye* (1782/3), a key text in the development of picturesque taste - and circulated extensively in M S form in the 1770s - describes a tour of south Wales and a visit to the dilapidated Tintern Abbey. He states,

> A more pleasing retreat could not easily be found. The woods and glades intermixed; the winding of the river; the variety of the ground; the splendid ruin, contrasted with the objects of nature; and the elegant line formed by the summits of the hills, which include the whole; make all together a very enchanting piece of scenery. Every thing around breathes an air so calm, and tranquil; so sequestered from the commerce of life...[21]

During his 1798 Wales tour, Turner also visited Tintern and made swift impressions at the junction of the Wye and Severn rivers, subjects which would feature in

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[19] Monkhouse (1879:43).
[20] Andrews *The Search for the Picturesque* (1990:53).
[21] Stephen Copley, Tourists "Tintern Abbey and the Picturesque", abstract from *Symposium: The Great Age of British Watercolours 1750-1880* (March 1993, Royal Academy of Arts Institute of Historical Research, University of London).

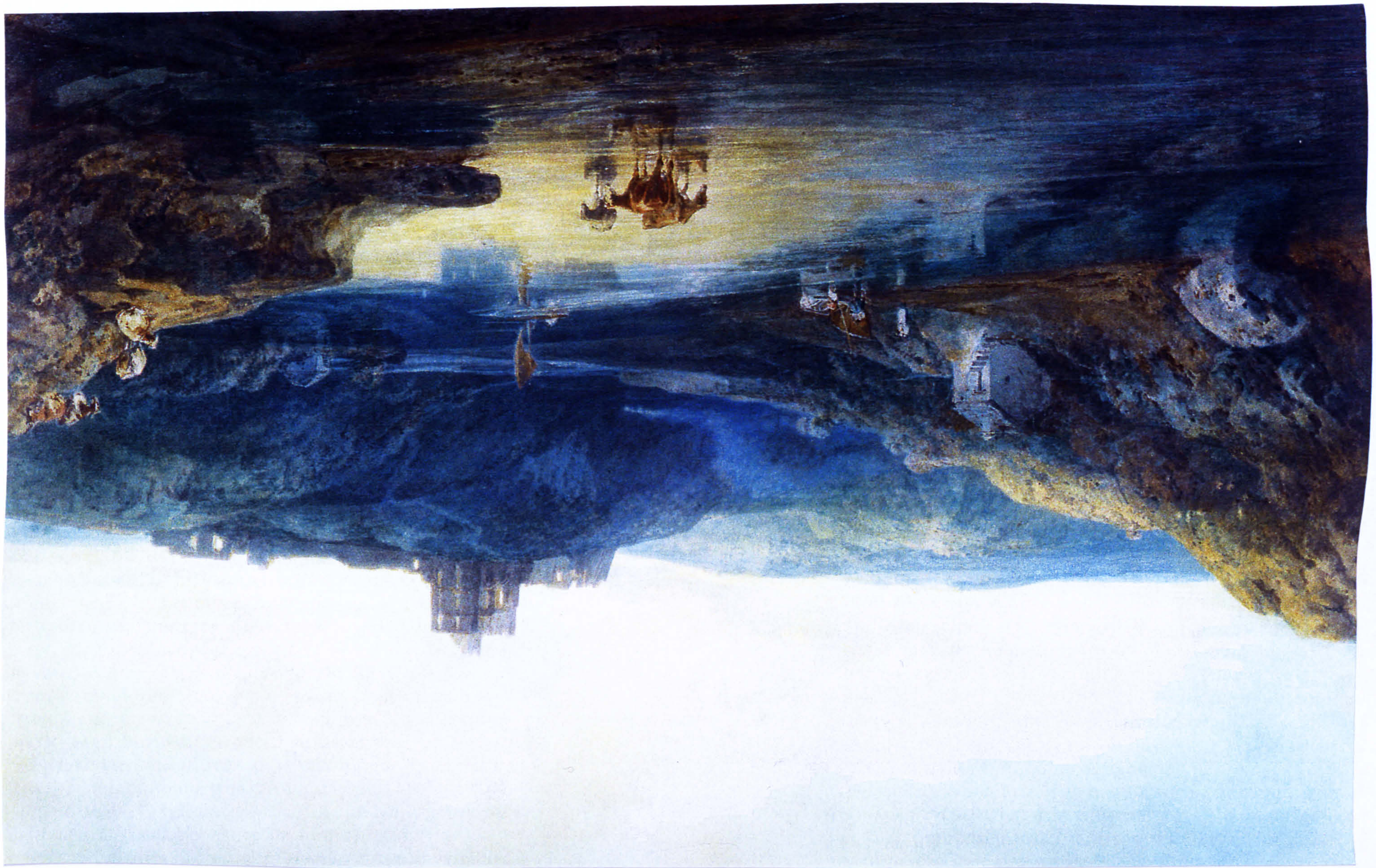

Fig. 17

Fig. 18

his *Liber Studiorum* project, a long running series of watercolours and prints between 1806 and 1819 (see figs. 19 and 20).

Many commentators and would-be men of taste, such as Richard Payne Knight and Uvedale Price, debated what precisely constituted 'picturesque'. Turner, though aware of their views, chose a simpler practical solution, scribbling notes in his copy of Martin Archer Shee's book *Elements of Art* (1809:fp7). He states,

> True Genius rises with its subject its power amalgamates its self th[r]o everything and can never be said to feel more or less than its subject [so] that wildness thro all its degrees should impress its sentiment what may be said is every thing is that is not simple; but simplicity the impression upon the mind and simplicity of subject are to me widely asunder hence the difficulty of defining the picturesque. Uvedale Price upon the Picturesque infers unevenness broken and undulating lines, but all these may be found in common pastoral the broken bank and uneven road may be often *picture-like* but requires size to render it wild, while the appearance of a practi[ca]ble road reduced it[s] character. Mr Knight maintains that seeking for distinctions in external objects is an error, and that such distinctions only exist in a well organized mind; but surely they exist in both … in Nature or the Painter could not draw his conceptions of her incidents by descriptions however florid if they were not natural, or originate by her assistance in the Poets mind, or such descriptions did not exist in his transcript of Nature. how could they challenge the recognition of a well organized mind.
>
> But picturesque is here but undefined it may be applied to Wildness - but rather hope it is prop[er] to say that tho
>
> Genius waves his raised shining wings
> Oer Wildness, yet the Picture like of things[22]

Ruin, decay, danger, terror and wildness were all motifs which could find a place in the picturesque or sublime. Much depended on what Turner felt or sensed a scene or idea conveyed to him at the time. More often than not, the two ideas merge in his watercolours, an early example being *Fonthill Abbey* (1800) (fig. 21), whilst his later works such as *The Picturesque Views of England and Wales* (1825-1838) include ideas and techniques he had absorbed in maturity.

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[22] Wilton (1987:9-10; TS Vol. 3, No. 1:38-39; TS Vol. 2 No. 2:44).

Fig. 19

Fig. 20

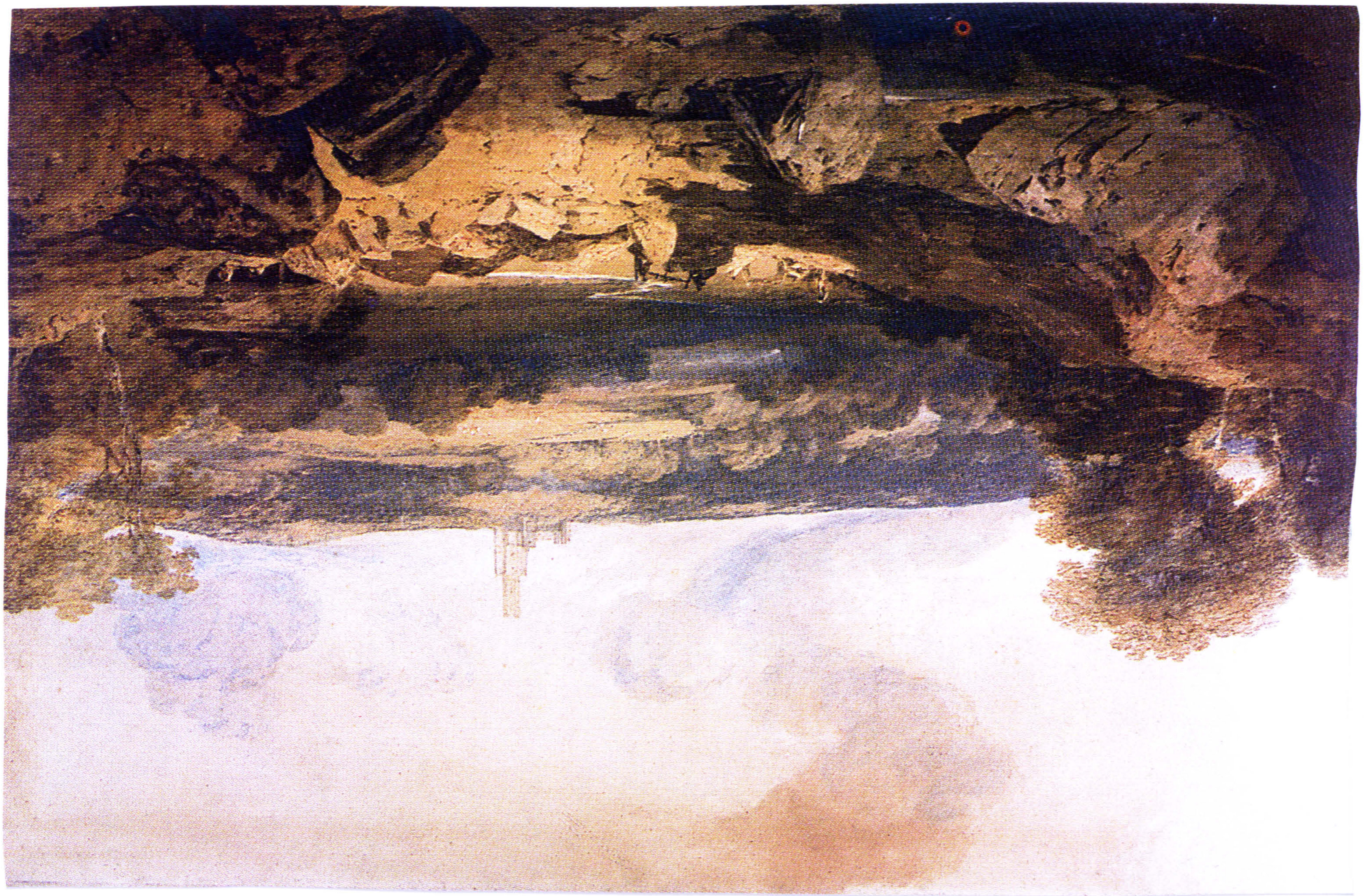

Fig. 21

The sublime

The notion of the sublime has its source in our own experiences. The Greek author Longinus wrote his treatise *On the Sublime* in the middle of the first century AD. He equated the sublime with excellence and as having an effect which could lift the soul into ecstasy. The French critic Nicolas Boileau (1636-1711) revived the subject and translated Longinus' text. By the early eighteenth century, the term sublime was what we might call a piece of jargon; the idea had acquired something of a cult status among the literary.

Edmund Burke's *A Philosophical Enquiry into the Origin of our ideas of the Sublime and Beautiful* (1757), a key text on the subject, became a source for British artists during the eighteenth and nineteenth centuries. Burke proposed that,

> the Sublime produced the strongest emotion the mind is capable of feeling. It is associated with the infinitely great, with gloom and obscurity. In nature, dark, confused, uncertain images have greater power on the fancy to form the grander passion than those have which are more clear and determinate. Whatever is in any sort terrible or conversant about terrible objects or analogous to terror is a source of the sublime.[23]

Burke also considered darkness and infinity - because we know little of their nature - and visual objects of great dimension to be evocative of the sublime.[24]

For Reynolds the sublime was guaranteed to "impress the mind at once with one great idea, it is a single blow".[25]

In sum, anything which has the power to transfix us or create a sense of astonishment and extraordinariness may be considered sublime.

There is no evidence that Turner read Burke's book. However, like Reynolds' views, they would have been common currency during his youth at the RA and Monro's studio (see following section).[26]

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[23] Burke (1992, reprint p36, 55, 58).
[24] Ibid. (p67-71).
[25] Reynolds *Discourse IV* (p65).
[26] TS Vol. 3 No. 1 p84.

What is crucial to recognise is that there were those who discussed, wrote about and debated what constituted the picturesque and sublime, whilst Turner produced it in his work, on his own terms. Indeed, he did not need to read about the subject when he could absorb visually the scenes of gloomy grandeur and spectacular effects in works by artists such as Alexander and JR Cozens, Richard Wilson and Philippe de Loutherbourg (- the latter's wife recalled when they were neighbours at Hammersmith circa 1810 that Turner was always trying to extract her husband's technical secrets from him).[27]

During the 1790s, his watercolours produced from tours of Wales, Scotland, the Lake District, Northumberland and Switzerland (1802) (figs. 17, 29 and 33) began to introduce, or rather create a sense of dramatic excitement missing from his earlier, merely topographic or picturesque compositions. He used large sheets of paper for works such as *Norham Castle* (1798), size 501x705mm, and mountain views in the Lake District and Switzerland to give the impression of vastness and grand scale (see figs. 17, 30 and 32). In visual terms, sharp angled precipices, threatening rocks and cliffs, storm clouds piling up in the sky, dramatic contrast of light and shade conveyed a sense that something would happen. Such sublime motifs recurred throughout his career (figs. 37 or 144). His early palette of solemn tertiary colours, browns, purples and greys - often found in stormy skies (Gilpin's ideas on colour harmony come to mind) - contributed to an air of gloomy grandeur.

From around the 1810s onwards, Turner began to incorporate the more vibrant primaries, red, yellow and blue into his watercolour painting as singular unsullied tints and touches as well as their secondary combinations.

His knowledge of both primary and tertiary colour effects enabled him to create marvellous optical colour combinations to dazzle the viewer and lead their eyes through a

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[27] Gage (1987:127).

labyrinthian complex of detail. This excess of sensory information may itself be considered sublime.

Storms were not the only natural phenomena which could trigger feelings of the sublime. The mountain scenery which Turner toured for picture making material became associated through the eighteenth and early nineteenth centuries with ruin, chaos, catastrophe and danger. The sublime landscape artist Salvator Rosa - championed by Gilpin - and the theologian Thomas Burnet's book *The Sacred Theory of the Earth* (1681) had helped establish this vision. For Burnet, mountains were evidence of violence in man and nature. The Great Deluge - a subject which featured in Turner's work in 1805 and a later oil painting *The Evening of the Deluge* (1843) - had been sent, according to Burnet, by God to wash away man's iniquity; its action created, "wild, vast and undigested heaps of stone - the ruins of a broken world" - that could be traced in mountainous gorges, vast lakes and among towering precipices.[28]

Just as the earth's topography had been formed by violent processes, molten flux and flood, the driving force behind Turner's pencil and brush could move mountains and valleys as he saw fit to make them artistically manageable. For if the location of a place can change over time,[29] why not the artist speed up or slow down this process within the spontaneous flicker of a pencil sketch. The fact is, Turner rarely drew a place as it really was, as we shall see in Chapter V; he often altered mountains and valleys by a sublime factor of two thirds to achieve effects of grandeur and to express more forcibly ideas of

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[28] Schama, *Landscape and Memory* (1995:450-452); see also Gage (1987:218-223) for more on Turner's engagement with geology.
[29] C Klonk, *Science and the Perception of Nature* (1996:88), Yale University Press.

height, depth and distance.[30]

It may well have been whilst Turner worked as a stage painter between March and June 1791 at the Pantheon Opera House, Oxford Street, London, that he gained confidence in establishing form with large blocks and sweeps of colour. On 14 January 1792, a fire swept the theatre and inspired his impressive watercolour, *The Pantheon the Morning after the Fire.*

Later in 1791, he stayed several weeks with friends of his father's, the Narraways, who lived at Broadmead, Bristol. Here he produced an early self portrait and made sketching tours of Bath and Malmesbury - his sketch of Malmesbury Abbey provided the basis for another watercolour exhibited at the RA - and found some sublime picturesque scenery in the Avon Gorge (see fig. 22). He also made a skilful watercolour of Stoke House, Bristol (fig. 23).

The above whetted his appetite for sublime and picturesque scenery, for in the summer of 1792 he ventured to south Wales to make drawings of waterfalls and abbeys, including a picturesque favourite, *Tintern Abbey on the Wye.*

A welcome boost came in 1793 when he received the prestigious "greater silver palette" award for landscape drawing from the Royal Society of Arts. His summer tour took in Hereford, Great Malvern, Worcester, Tewkesbury and Tintern; autumn saw him in Kent and Sussex.

In 1794 he toured Kent again and a series of Welsh towns for a project of 32 views to be printed between 1794 and 1798. He explored the sublime scenery in the

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[30] Wilton, *Turner and the Sublime* (1980:78-79). The philosopher, writer, poet and artist Johann Wolfgang Goethe (1749-1832) traced a similar thread through creative and natural processes when freed from a bout of writer's block. Having many ideas for his novel *Werther* suspended in his head but going nowhere, he heard the news of his friend's death Jerusalem and stated, "At that instant, the plan for Werther was discovered, the whole shot together from all sides and became a solid mass, just as water in a vessel on the point of freezing is transformed by the slightest shock into solid ice". See RD Gray, *Goethe The Alchemist* (1952), Chapter 6.

Fig. 22

Fig. 23

Midlands, Derbyshire and Matlock where JR Cozens began to experiment with his father's system of painting landscapes.

Monro's studio

It was in 1794, two years after Reynolds' death, that Turner entered Dr Thomas Monro's (1759-1833) Adelphi Street Studio, London. Monro paid Turner and his friend Thomas Girtin (1775-1802) to copy art works by old and recent masters in his collection. This they did for three years on Friday evenings between 6 pm and 10 pm, often under lamplight. Dr Monro, as late consultant physician to King George III and principal physician at Bethlehem Hospital - where Turner's mother ended her days - knew the value of testing theoretical knowledge in practice whilst healing the sick. He encouraged artists under his tutelage to acquire knowledge by copying past and recent masters, then to confront nature's complexity themselves.[31] By 1794, Turner and Girtin were already doing this but the companionship and contacts who came into the studio introduced them to different styles, techniques and stimulating ideas. Monro's friends included neighbour John Henderson, an amateur and collector and Thomas Hearne (1744-1817), a topographic artist and engraver (his *Antiquities of Great Britain* began publishing in the 1770s, completed 1807) whose watercolours Turner copied.

The diarist Joseph Farington (1747-1821), RA artist and acquaintance of Turner, recorded in 1797, "Dr Monro's house is full of drawings. In the dining parlour 90 drawings framed and glazed are hung up – and in the drawing room 120 – They consist of drawings of Hearne, Barrett, Smith, Laporte, Turner, Wheatley, Girtin".[32]

Monro's studio also contained copies of Poussin, Rembrandt, Savery, Salvator Rosa, Claude, and from the British school, Wilson, Sandby, Gainsborough (a favourite of

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[31] Klonk, ibid. (1996:113).
[32] Gage (1987:78).

Dr Monro), de Loutherbourg, Rooker and Edward Dayes whose book *The Works* (1805) Turner possessed; it contained references to Claude Lorrain's style (see following section) and watercolour techniques in general. [33]

In addition, the works of Alexander Cozens (1717-1788) and his son John Robert (1752-1797), both exponents of the picturesque, were accessible at Monro's. The latter's landscapes, which have an "eerie, surreal, almost hallucinated stillness" about them, were among the works Turner and Girtin emulated.[34] Turner would produce his own versions of JR's scenes, namely *Lake Albano* (1828) (fig. 9) and *Lake Nemi* (1840) (fig. 11). Unfortunately, JR ended his days under the care of Dr Monro suffering from an incurable mental illness.

One work of gloomy incarceration which Turner took to during his years at Monro's was *Carcere Oscura* – an interior of a prison, copied circa 1794/1797[35] by the highly imaginative artist/printmaker GB Piranesi (1720-1778). It echoed in chiaroscuro the dizzying perspectives and interiors of Turner's abbeys and buildings of the period.

Thus the two young artists became further schooled with past and present masters and the traditions and techniques of topographic and picturesque art but with an eye to creating their own style, the latter being Turner's ambition to become a painter of the imagination.[36]

In 1795, Turner stayed at the historian and banker Sir Richard Colt Hoare's home. Here he saw Hoare's collection of old master paintings and Piranesi prints, as well as the famous gardens built during the 1740s and 1750s to a style resonant with Claude Lorrain's landscape paintings. Hoare was among many wealthy patrons and artistocrats with whom Turner forged friendships from his late teens onwards. Some friendships

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[33] TS Vol. 4, No. 2 p8-23.
[34] Schama (1995:471-478).
[35] Gage (1987:102).
[36] Butlin (1962:7-8).

developed further than financial transactions. Many provided a home and base from which Turner could explore the surrounding countryside as he travelled by coach and inn during his sketching tours; men like the Hon. Edward Lascelles (Harewood House), Yorkshire, William Beckford (Fonthill), Wiltshire and London, Sir John Swinburne (Capheaton), Northumbria, Lord Darlington (Raby Castle), Durham and in the 1800s he became special friends with the Third Earl of Egremont (Petworth), Sussex and Walter Fawkes (Farnley Hall), Yorkshire, among others.

In the summer of 1795, Turner sketched on the Isle of Wight; 1796 saw him doing the same on the estate of William Lock of Norbury and in and around Brighton.

He began a crucial tour of the North of England in 1797, now aged 22, sketching Norham Castle on the Tweed – to which he attributed so much of his good fortune – the sublime Lake District, Yorkshire, Harewood House and Durham. In the same year he filled a little sketchbook with impressive studies of Richard Wilson's work, heavily influenced by the likes of Nicolas Poussin and Claude Lorrain.

A tour of Kent began in the spring of 1798 and later in the year, Malmesbury, Bristol and north Wales; the latter furnished him with material for his RA Diploma picture, *Dolbadern Castle* which he presented in 1802.

The influence of Claude Lorrain's work on Turner's watercolour practice

1799 became a landmark year for Turner. A tour of Lancashire and north Wales was topped off with the news of his election as an RA Associate. It was also the year when Turner first saw Claude's original oils in May 1799 at Beckford's Grosvenor Square home in London – *Landscape with the Arrival of Aeneas at Pallanteum* (1675) (fig. 24) and *Landscape with the Father of Psyche Sacrificing to Apollo* (1662) (fig. 25). He returned the following day with Girtin, making a watercolour study of the first

painting whilst Farington recorded 8 May 1799 that Turner believed the latter work "seemed to be beyond the power of imitation".[37]

The brilliant colours of Claude's work would have brought to life Richard Earlom's three volume edition of engravings in etching and mezzotint of Claude's *Liber Veritatis* (Book of Truth, a record of his work to safeguard from forgeries). Earlom's work was published from 1777 onwards. It may not have matched the standard of the original but it gave the public access to, or at least a taste of, the master's work. It is highly probable that Turner saw Earlom's copies, along with others, during his youth at the RA and Monro's studio.

Indeed, out of the many past masters Turner studied – Poussin, da Vinci, Rubens, Titian, the Dutch masters, including Rembrandt - it is Claude's work which influenced his watercolour practice the most and became the touchstone by which he would hone many of his own skills and techniques in both watercolour and oil.

Around the same time Turner visited the financier John Julius Angerstein's collection of old masters, among them a sea port by Claude, *The Embarkation of St Ursula* (1641) (fig. 26). Angerstein's Claudes would have a profound effect on Turner. The financier caught the young artist in a tearful state of agitation whilst looking at the above picture and, on enquiring what all the fuss was about, Turner replied, "Because I shall never be able to paint anything like that picture".[38]

In 1803 Angerstein acquired Claude's *Seaport with the Embarkation of the Queen of Sheba* (1648) (fig. 27). The work became such a favourite with Turner, he stipulated in his will that his own work *Dido Building Carthage* (1815) should hang beside it after his death (1851). The two paintings still hang together today in the National Gallery, London, due to Angerstein's Bequest.

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[37] Wilton (1987:40).
[38] Wilton, ibid. and TS Vol. 2 No. 2 p8.

Fig. 24

Fig. 25

Fig. 26

British collections held some of, if not the finest examples of Claude's work and Turner could study them in the Third Duke of Bridgewater's gallery and at Lord Egremont's, Petworth House, Sussex in the 1800s onwards.

In 1811 when Turner gave the first of his RA lectures as Professor of Perspective (he had been elected to the post in November 1807 and retained it until 1837), he paid homage to Claude in his Backgrounds lecture, stating:

> Pure as Italian air, calm, beautiful and serene, springs forward the works and with them the name of Claude Lorrain. The golden orient or the amber-coloured ether, the mid-day ethereal vault and fleecy skies, resplendent valleys, campagnas rich with all the cheerful blush of fertilisation, trees possessing every hue and tone of summer's evident heat, rich, harmonious, true and clear, replete with all the aerial qualities of distance, aerial lights, aerial colour where through all these comprehensive qualities and powers can we find a clue towards his mode of practice?
> … As beauty is not beauty until defined or science science until revealed, we must consider how he could have attained such powers but by continual study of parts of nature. Parts, for had he not so studied, we should have found him sooner pleased with simple subjects of nature and [would] not [have], as we now have, pictures made up of bits but pictures of bits.[39]

In order to understand how Claude's work influenced Turner's watercolour practice it is necessary to outline what constitutes a Claudian picture, his 'mode of practice'.

Claude was inspired by many of the stories in the Bible and works of the Roman poets Ovid (43 BC – 17 AD) and Virgil (Publius Vergilius Maro 70 BC – 19 BC) in particular. Ovid's book *Metamorphoses* is a collection of Greek myths where the central theme is one of transformation, of chaos changed into harmony, animals into stone and where men and women become trees or stars.

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[39] Helen Langdon, *Claude Lorrain* (1989:9, Phaidon Press) and Michael Kitson, *Turner and Claude* (TS Vol. 2 No. 2 p2-15). For more on Claude, see M Waddingham, *Claude Lorrain, The Masters* (1966:55), M Roethisberger, *The Paintings* (2 vols., 1968, Berkeley), Humphry Wine, *Claude, The Poetic Landscape* (1994, National Gallery Publications), JJL Whiteley, *Claude Lorrain, Drawings from the collections of the British Museum and the Ashmolean Museum* (1998, British Museum Press), Gillian Forrester, *Turner's Drawing Book, The Liber Studiorum* (1996, Tate Gallery Publications).

Fig. 27

Virgil's works often feature a locus amoenus, a place of peace, tranquillity and mystery, albeit with a hint of menace lurking in the forest. Such places were to be found well away from busy cities with all their human vanities and deceits. These idyllic places provided a stage where an interaction could take place between Virgil's mortal characters and the supernatural forces of the celestial realm, represented by the gods, goddesses and their intermediaries. Claude searched for such magical sites as he walked around the Roman Campagna – the countryside surrounding Rome and Tivoli. There among the ruins of past empires he would sketch and paint "parts of nature". The sketches provided a stock of material to draw upon when composing his paintings back in his Rome studio.

Claude's pictures made up of bits

From the many finished and unfinished drawings, watercolours, prints and oil paintings Claude left behind, not to mention his *Liber Veritatis* (Book of Truth), it is possible to deduce how he composed a picture. Claude's early biographers, Joachim von Sandrart and Filipo Baldinucci, also provide invaluable information about his working methods.[40] His approach to picture-making was broadly as follows. He would often take his vantage point from rising ground where "the view from the middle to the greatest distance" could be seen.[41]

Drawing faint pencil lines, he would begin by dividing his pictorial space on the page into five equal parts lengthways, in thirds widthways, diagonally from corner to corner, placing the horizon approximately two-fifths (see fig. 28) from the bottom and the vanishing points where he saw fit. Sometimes he would disregard the above framework and proceed intuitively. Then the picture's outline would be drawn in either pencil or quill pen.

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[40] Langdon, ibid. (1989:19).
[41] L Gowling, "Nature and the Ideal of Claude", *Art Quarterly* (vol. 37 1974:95).

Next he would often lay in the sky from the top of the paper (or canvas if oil painting) to the horizon with a wash of paint, gradating stronger and deeper in tone at the top but less so towards the horizon to create the illusion of receding distance.[42] The illusion was further enhanced by placing the distant landscape forms, clouds, mountains, hills and so on in faint, transparent washes and tints gradually increasing their tonal values to the foreground. In the middle plane, he would place small hills, fields, buildings, lakes, bushes, trees and real or imaginary ruins (see fig. 25). Then he would work on the foreground details, the ruins of broken masonry, the massing of foliage and dark trees contrasting against the sky, setting off the tonal transitions from the distant planes to the foreground. Thus the initial tonal gradations of flat colour produced the illusion of volume, space and distance, carved up with the dramatic effects of light and shadow. Claude would rearrange the above pictorial elements like theatrical scenery. His tranquil, dream-like settings were peopled with heroes, pastoral figures, shepherds, angels, gods and goddesses. They came and went like actors suspended in time within mythical and Biblical landscapes.

Claude's oils used the above compositional devices, often incorporating polychromatic streakings of salmon pinks, green blues and violet greys as key tints. The whole effect was enhanced by the progressive saturation of local hues by the colours of light and air. Claude's biographer, Sandrart, who had known the artist in Rome in 1630, stated he "knew how to break the hard quality of the colours and to mix them so that they no longer resembled those colours but what he wished to represent".[43]

Breaking the hard quality of colours by fading with brushfuls of water, wiping or sponging, then sometimes interlacing the resulting texture with stippled, mottled and

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[42] Claude painted many of his watercolours using a rich brown paint called *bistre* made from beech wood soot, as well as other pigments such as earth reds, yellow and lead white. The papers he used were handmade, laid, linen rag based, gelatine sized, manufactured by the many Italian paper mills.
[43] L Gowling, ibid. (1974:92).

Fig. 28

dappled touches of paint was just one of the techniques central to Turner's watercolour practice discussed in Chapters V to VIII.

During the next decade Turner strove to emulate Claude's luminous effects and tonal tricks in both watercolour and oil mediums. However it was not until about the time of his 1811 lecture, quoted earlier, that he succeeded in this endeavour. Claude's work not only inspired an important watercolour and printmaking project, as we shall see, in 1806, but two important tours to Italy in the succeeding decades. The first tour in 1819 contributed to an overall shift in his use of colour. It became increasingly prismatic – an influence of the Italian light. The second tour in 1828 would inspire some of the finest masterpieces in the medium.

Meanwhile in 1800 Turner had visited Beckford's Fonthill, the subject of his watercolours exhibited that year. Before the year was out, his mother was admitted to the Bethlem Hospital for the insane. 1801 saw him attending Henry Fuseli's lectures on painting at the RA in March, whilst a tour of Scotland, the Lake District and Chester followed in summer.

Elected as a full Royal Academician in February 1802 , in the summer Turner ventured on his first continental tour in the brief "Peace of Amiens", visiting France, the Louvre – where he studied Poussin's work and made a watercolour copy of Titian's *Entombment* – proceeding on to Switzerland. The latter provided him with the sublime scenery to far outstrip the Welsh and Scottish landscape he had toured the previous year.[44] Switzerland would remain in his blood for the rest of his life, and he returned again and again in his late career. The sketches made during his first tour resulted in some impressive watercolours, including *The Great Fall of the Riechenbach in the Valley of*

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[44] J Gage, "Turner and the Picturesque", *Burlington Magazine* (CV II, 1965:21).

Hasle, Switzerland (exhib. 1804) (fig. 29); a whole range of works centred around The Devils Bridge in (1803-1804) (fig. 30) and *Glacier and Source of the Arveron going up to the Mer de Glace* (1803) (fig. 31) and *Mont Blanc from Fort Roch, Val d'Aosta* (c1814) (fig. 32); *St Hugh Denouncing Vengeance on the Shepherd of Cormayeur in the Valley of d'Aoust* (exhib. RA 1803) (fig. 33) especially contains both sublime and Poussinesque influences. On his return to England, his friend Girtin died, 9 November.

In 1803 he exhibited both watercolours and oils at the RA and continued to do so until his death in 1851, missing only four seasons in all that time. The year also saw him begin work on his own gallery, completed and open in 1804. The gallery at 64 Harley Street provided him with the freedom to exhibit when and what he saw fit. The year was marked with the death of his mother in Bethlem Hospital.

During 1805 after his move to Sion Ferry House at Isleworth, he produced a range of watercolour, pencil and oil studies on and around the River Thames. His friend and neighbour the Rev. Henry Scott Trimmer tried to teach him the rudiments of Latin and although he did not show any dexterity with the dead language, his watercolour studies, which transmogrified the modern Thames in an instant, brought to life scenes from the Aeneid and Ovid's stories in a way the scholar could not (see fig. 15). The same year he made sketches and notes from sailors on HMS Victory when it returned to Sheerness from triumph at Trafalgar, carrying Nelson's body.

The influence of printmaking on Turner's watercolour techniques

It was during 1806 whilst staying at WF Wells Knockholt home that the latter urged Turner to go one better than Earlom's attempts at emulating Claude in his series of prints circa 1777, cited earlier.[45] The result was Turner's project *Liber Studiorum*, a series

[45] Forrester (1996:10).

Fig. 29

Fig. 30

Fig. 31

Fig. 32

Fig. 33

of 71 mezzotints (see below) published between 1807 and 1819 depicting historical, marine, architectural and elevated pastoral scenes under their respective headings derived mainly from material Turner had gathered during his sketching tours.

The project marked one of many engagements with the printmaking industry during his career. Indeed many of the watercolours Turner was commissioned to produce served as the basis for series of engravings to furnish the growing demand by the middle class for prints in the early nineteenth century. Overlapping the *Liber* project were *The Picturesque Views of the Southern Coast of England* (1814-1826), *Views in Sussex* (1816-1820), *The Rivers of England* (1823-1827), *The Ports of England* (1826-1828, published by William Bernard and George Cooke, bros.) and *The Picturesque Views in England and Wales* (1825-1838, published by Charles Heath).

In addition Turner produced watercolours for book engravings, illustrating Samuel Roger's poem *Italy* (published 1826-1828), Lord Byron's *Works* (published 1832), Sir Walter Scott's *Poetical Works* (published 1832), Milton's *Poetical Works* (published 1835-1836), Thomas Campbell's *Poetical Works* (published 1837) and Thomas Moore's *The Epicurean* (published 1839).

Although Turner was already familiar with basic printmaking techniques honed during his youth at the RA, the above projects increased his awareness of how engravers created variations in depth of tone by the use of finely gravured lines, painstakingly executed and compressed into small spaces (see fig. 34). Indeed there were times when he felt compelled to have a go at the engraving process himself. The mezzotint medium revealed how an arrangement of lights and darks (chiaroscuro) could be achieved economically. In short, the absorption of printmaking techniques aided his own spontaneous approach to picture-making.

However, Turner's innovative watercolour style was more than engraving or oil techniques translated into painterly practice, as we shall see in Chapters V and VIII. For example his late *Swiss* watercolours (1840s) (see figs. 2 and 5), never destined to be engraved, still contain intricate "minute and measured touches of colour" aka stipple and hatching, among other techniques.[46]

Finberg believed that Turner's watercolours, "were painted without the slightest consideration for the requirements of the engravers. The demands of the engravers and their medium received ample attention after the drawings were made, as Turner's work on the touched proofs demonstrates.[47]

During 1807 much of Turner's time was spent oil painting. In the summer he sketched in oils from a boat on the rivers Thames and Wey.

In the summer of 1808 he visited Farnley Hall, Yorkshire, the home of Walter Fawkes, a descendant of the infamous Guy Fawkes. A liberal concerned with the abolition of slavery and the reform of Parliament, Fawkes became a keen collector of Turner's work.[48] They became lifelong friends, sharing a passion for fishing; some interesting family recollections of Turner's practice in the watercolour medium are cited in Chapter V.

1809 saw him helping his friend Sir John Soane with his own RA lectures on architecture and continuing to exhibit watercolours and oils in both his own gallery and the RA. During the summer he visited Lord Egremont at Petworth House, Sussex, another close friend and patron, then proceeded with a sketching tour of Yorkshire, venturing onto Cockermouth Castle, Cumberland. In 1810 he moved to Queen Anne Street, visited

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[46] Wilton, *Turner in Switzerland*, exhibition catalogue, cited in "Turner Watercolours", *Agnew's Catalogue 28 February – 25 March* (1995:9).
[47] Finberg (1961:281, see also p216).
[48] For more on Turner at Farnley Hall, see David Hill, *Turner's Birds: Bird Studies from Farnley Hall* (1988, Phaidon Press).

Fig. 34

the MP Jack Fuller at his Rosehill home, Sussex to make a series of drawings and watercolours and toured Yorkshire again, staying at Fawkes' in August.

By 1811, Turner had absorbed the tenets of architectural drawing, topography, the picturesque and sublime, crucial watercolour and oil techniques of past and present masters, especially those of Claude, his favourite; he blended their influences with his imagination and realised through his own practice. He was also well versed in the classical and Biblical stories which preoccupied Claude and other masters; the difference between many of his peers was that Turner could recognise their resonance in contemporary events. Since his youth, he had sought out his own locus amoenus, evocative sites in the Sussex, Northumbrian, Yorkshire and Thames landscape and continued to do so on his continental tours.

Armed with this knowledge and confidence, he began his series of RA Perspective lectures in January 1811; the course ran until 1828.

The lectures for which he had spent four years to prepare and gather material culled from a range of past and present authorities – Euclid, Junius to Malton (whom he had worked under as a youth) and Brook Taylor. As a practising artist, he knew the subject of perspective was inherently dull and boring but he always had a range of illustrations in watercolour to bring the concepts to life. July to September saw him touring Dorset, Devon and Cornwall, gathering material for Cooke's *Southern Coast* series, with November spent at Fawkes' family home.

1812 consisted mainly of RA business, lecturing, exhibiting at his own gallery and overseeing the building of his new home, Sandycome Lodge, Twickenham. November was again spent at Farnley, repeating the visit the following year. 1813 began with Turner's RA lectures which now remained an almost permanent feature of each January until 1828, interrupted only by his Italian tour and other business. He toured Devon in the

summer and did the same the next year. Both 1814 and 1815 were dominated by work in the oil medium, though he chose Sussex for his summer tour in the latter year.

Early business at the RA – which included chairing Fuseli's lectures in 1816 – was followed in the summer by a tour of Yorkshire. Using Farnley Hall as his base he set about satisfying his commission from Longman's (publishers) to produce twenty watercolours in one of the wettest years on record for their *History of Richmondshire* series. In the Yorkshire landscape, Wharfedale became a particular favourite of Turner's. Andrew Wilton lists a total of forty eight finished watercolours and sketches made between 1816 and 1820 that capture it in all moods and weathers.[49]

A chance to tour abroad again finally came in the summer of 1817. He sailed to Ostend, visited the battlefield of Waterloo, sketching and making notes of incidents, toured the Rhine and produced fifty one watercolours which Fawkes bought on his return. Energised by his own prolific output, he travelled to Raby Castle, seat of Lord Darlington, staying to sketch and paint it. Using it as a stepping stone, he gathered material in County Durham for Robert Surtees' project the *History of Durham.*

The next two years were transitional for Turner. In April 1818 he attended William Hazlitt's lectures on English poets, a source of inspiration for many of his works. The submission of more watercolours and oils to exhibit at the RA was followed by a commission by WB Cooke for twelve Rhine drawings/watercolours to be engraved, a figure increased to thirty six the next year. He was also preoccupied with the gathering of material in Scotland during the autumn for Sir Walter Scott's *Provincial Antiquities of Scotland* project. His visit to Farnley at the end of the year yielded the famous watercolour *First Rate Taking in Stores* (fig. 35 and 36), described in Chapter V.

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[49] Hamilton (1997:169).

Fawkes' London home played host to Turner's exhibition of more than sixty watercolours during the summer of the following year. Afterwards Turner left England in August for a tour of Italy, arriving in Rome on 27 October and staying until February 1820. He filled over a dozen sketchbooks, making one and a half thousand drawings around Rome alone.[50] Here he could observe the landscape which had inspired Claude, Poussin, J R Cozens, among others – all favourites since his youth. It dawned on him that the landscape differed from that which Claude had painted. Claude, like Turner, would transmute a common or bland view into an idealised scene. Turner wrote "Claude" or "Wilson" on his sketches or labels such as "very like Ld Eg Claude" whenever he came across a view which reminded him of their work.[51] In addition he made studies of Claude's and other master works in Rome.

The sketches he made during his Italian tours were both literal, topographic and sublimely picturesque. They served as the basis for some of his most impressive and innovative watercolours, many transmogrified by memory twenty years later (see fig. 11). The pure light and colour of the Italian landscape reinforced his emphasis towards a primary, more prismatic palette centred around warm reds, acidic yellows and cool blues especially in his post 1820s watercolours. However, the tertiaries were not abandoned; they were inextricably interwoven into his practice and helped to create the shimmer of the Italian landscape.

On his return to England in February 1820, he spent much of the year attending to RA business, domestic practicalities and the construction of a second gallery – there was no summer tour. However, as Hamilton notes, "The 1820s were the hinge of Turner's life.

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[50] See Cecilia Powell, *Turner in the South* (1987) for a full account of this tour and Hamilton (1997:195-204).
[51] Powell, ibid. (p74 and p31).

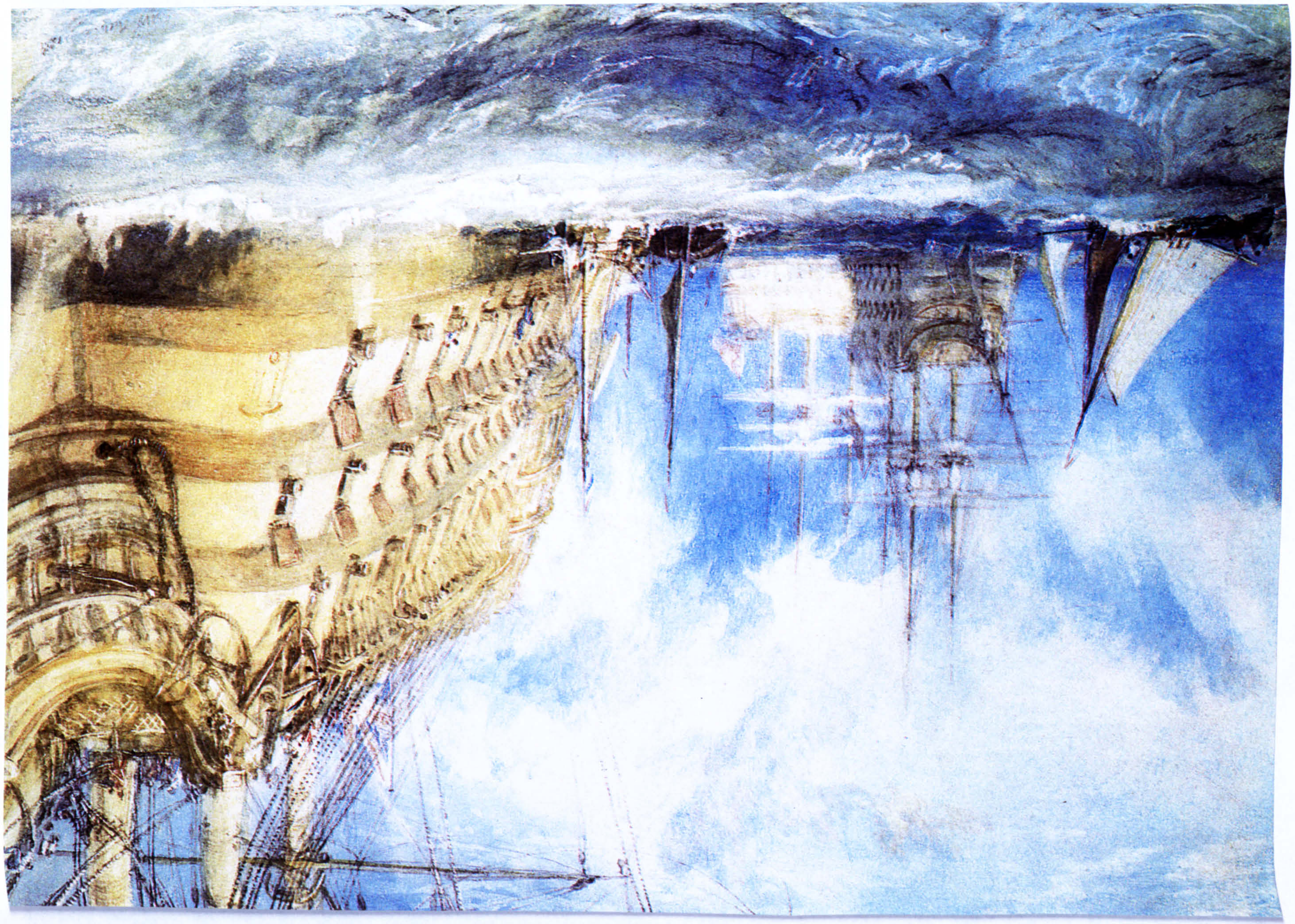

Fig. 35

Fig. 36

During these ten years he changed from being a painter of tone, 'the infinite interchange of tints', to a painter of colour".[52]

Turner's watercolour work in the early 1820s was dominated by satisfying engraving commissions for publishers such as the Cooke brothers, Charles Heath and Thomas Lupton, whose series such as the *Rivers of England* were cited earlier.

The watercolours he supplied were painted from memory and old sketches at his table in Queen Anne Street. They were often intricate detailed works, jewel-like, laced with visual puns, metaphors, social comment, local history and folk tales (see fig. 37).

Cooke exhibited twenty four of these watercolours in his London gallery during February to August 1822, eleven more in 1823 and another sixteen during 1824 - no mean output.

Turner renewed his summer sketching tours with a visit to Paris, Rouen and Dieppe in 1821, returning to Farnley at Christmas. In May of the following year he opened a new gallery and travelled to Edinburgh in August to sketch George IV's tour.

1823 began with visits to the RA painting school and spent concentrating on his watercolour commitments and preparing his Claudian oil, *Bay of Baiae* for summer exhibition at the RA. He sketched the English and French coasts from the channel in September and returned to Farnley in the autumn. His routine visits and lectures to the RA continued early into 1824. Membership of the new Athenaeum gentleman's club in June provided him with a quiet environment where he could meet the likes of Michael Faraday, Humphry Davy and other characters full of interest and ideas.

After sketching the south and east coasts in the summer, he returned to Farnley for the last time, for on 25 October, 1825, his close friend and confidant Walter Fawkes died. The news overshadowed his tour of Holland and Belgium which he had begun in August.

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[52] Hamilton (1997:216-217).

The year also marked the beginning of the *Picturesque Views in England and Wales* series which echoed Boswell's scenes that he had tinted as a young boy.

1826 saw twenty nine of his watercolours, mainly from Farnley, exhibited at the Northern Society in Leeds during late summer. A tour of the rivers Meuse, Moselle, Loire and the Brittany region began in August and lasted until November. On return he began illustrating Samuel Roger's poems for his *Italy* project.

Though the loss of Fawkes was a hard blow, Turner found solace at the architect John Nash's residence, East Cowes Castle on the Isle of Wight. Here during July to September 1827 he produced one hundred or so drawings.

Another close friend, Lord Egremont, provided him with a home from home at Petworth. Rogers joined him there in October as he made the last vignette for his *Italy Series*.

After attending to routine RA business, including giving the last of his Perspective lectures in 1828, Turner set himself up for his second tour of Italy but only after he had finished some watercolours for the *England and Wales Series*, as he told Charles Eastlake, an RA colleague. It was in August that he finally visited Rome, travelling via Paris, Lyon, Avignon, Genoa and Florence. He busied himself with cutting into oils as well as watercolours, sketches and preparatory studies and socialising was not neglected, Rome being a thriving colony of foreign artists and British expatriates.[53]

He returned to England in February 1829, via Loreto, Ancona, Bologna, Milan, Turin, Mont Cenis and Mont Tarrar – the horrendous travelling conditions were summed up in the watercolour depicting his coach caught in a *Snowdrift upon Mount Tarrar* (22 January 1829).

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[53] For more on this tour, see Powell (1987) and Hamilton (1997:235-241).

Fig. 37

It was a year of deeply mixed fortune: His oil masterpiece *Ulysses Deriding Polyphemus* was ready for RA exhibition in May, he had thirty six watercolours exhibiting at Charles Heath's Egyptian Hall gallery in Piccadilly during the summer, a tour of Paris, Normandy and Brittany in August/September, returning to Petworth House. The end of the month saw the death of his father, aged 85, a bitter blow after a series of losses. The sadness continued in the new year with the passing of another artist friend, Sir Thomas Lawrence on 7 January. Turner recalled the event in his watercolour *Funeral of Sir Thomas Lawrence*, a sketch from memory (see fig. 38).

The demands of business would not go away and in late summer, he toured the Midlands to gather more material for the *England and Wales Series*.

During the early 1830s he became a regular visitor to Margate, a childhood haunt full of fond memories and everchanging atmospherics of land, sea and sky to paint. There he stayed at Mrs Sophia Booth's boarding house and they became closer after the death of her husband in 1833 and she provided him with a home from home until the end of his life.

Preoccupied during this period with his own mortality, he attended to the matter of his own will, continued with his visits to the RA painting school and Petworth House. During the summer of 1831 he toured Scotland for Scott's *Poetical Works* and sketched Staffa's Cave, a favourite picturesque site.

Perhaps deemed too controversial or maverick, Turner was denied by election the RA presidency – maybe a blessing in disguise. By the 1830s, Turner could paint any style he liked; he could be an old master or a new one. His oils painted in this decade, such as *Rocky Bay with Figures*, *The Fighting Temeraire*, *Apollo* and *Daphne, Juliet and her Nurse*, among many others, still received stiff criticism and ridicule.

The finest examples of Turner's technical virtuosity in the watercolour medium during this decade came in the shape of his vignette illustrations painted for a series of poets' works cited earlier (such as Roger's and Campbell's). They brought his manner of techniques "down to as small a scale of imagery as any man could reasonably hope to achieve and still retain effective eyesight. Turner's touch in these little masterpieces is breathtaking in pictorial detail, physical form and narrative atmosphere".[54] Taking Campbell's series as a prime example, the techniques and materials involved in their construction receive special attention in Chapter VIII (see figs. 143 and 144).

His summer tours resumed in 1832, crossing the Channel to sketch in Paris as part of the illustrations for Scott's *Life of Napoleon* and the *Rivers of France Series*. He spent Christmas with Nash and the sublime romantic painter John Martin at East Cowes Castle after a stint at Petworth.

His next tour in 1833 proved even more extensive. He sketched Copenhagen, Berlin, Dresden, Prague and Vienna,[55] went along the Danube to Salzburg and then through Berchtesgaden to Innsbruck and over the Brenner Pass to Verona and finally to Venice, returning to England in October.

More vignettes were produced during 1834, six for Byron's works, twenty five for Finden's *Biblical Series* - a year that saw the oil masterpiece *The Golden Bough* exhibited at the RA. His summer began with a visit to Oxford, then on to a tour of the Rhine, Meuse and Moselle – a repeat of his 1826 tour. A session at Petworth in September was followed by his witnessing of the fire which destroyed the Houses of Parliament. The sketches he made from a boat on the Thames would later be developed into impressive watercolours and oils, exhibited early the following year.

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[54] Hamilton (1997:263).
[55] See Hardy George, *Turner in Europe in 1833* (TS Vol. 4 No. 1 p2-21).

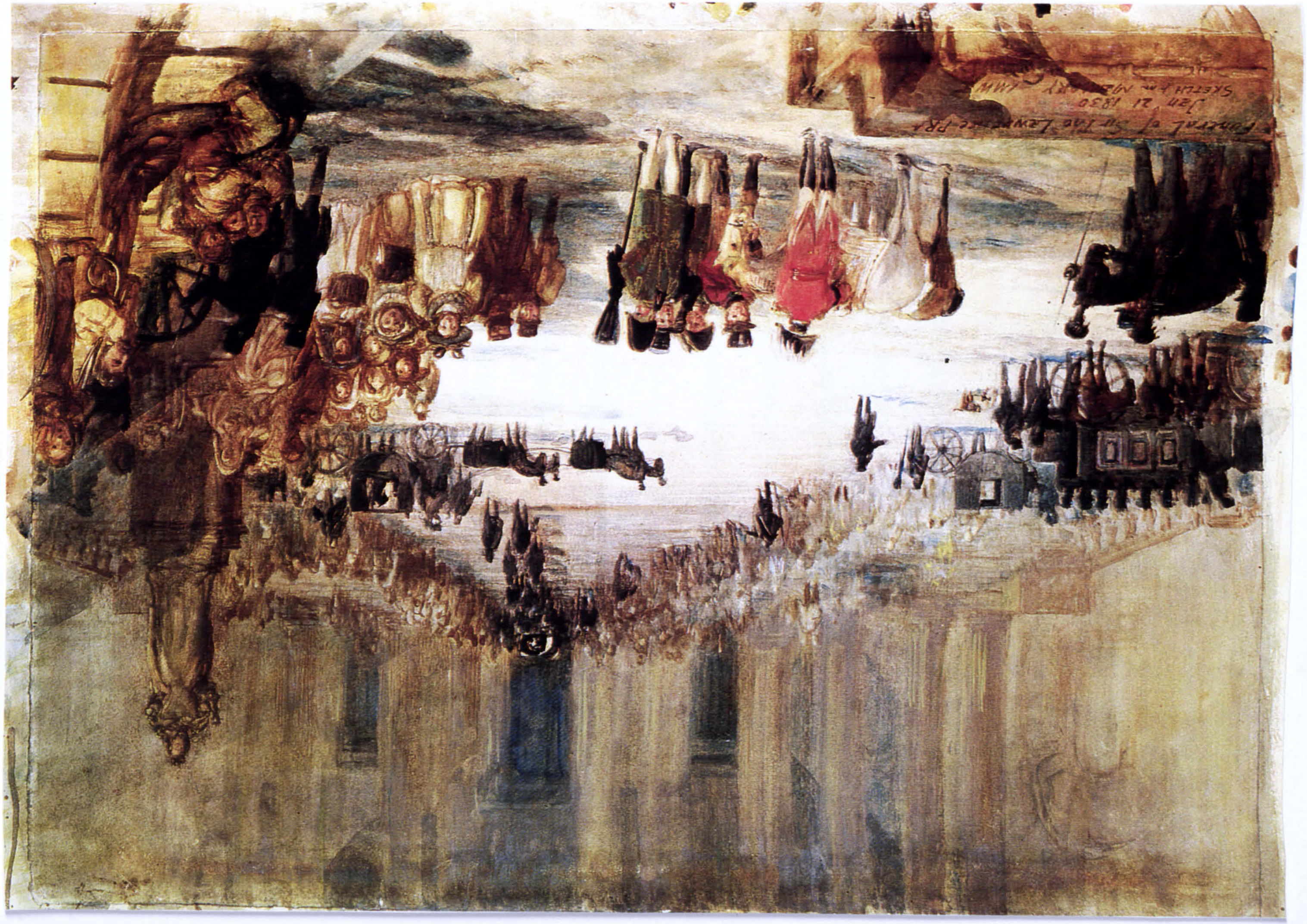

Fig. 38

The middle of the decade was spent concentrating on watercolour and oil production as well as the usual RA and domestic affairs. It was one of his oils, *Juliet and her Nurse*, exhibited at the RA in 1836, which would trigger a series of events beyond his control. The work received stiff criticism from the Rev. John Eagles of *Blackwood's Magazine* that compelled the young John Ruskin, Turner's would-be champion and critic writer, to mount a vigorous written campaign in his favour which would last for years and culminate in the volumes entitled *Modern Painters*. Son of a wealthy sherry importer, Ruskin failed to realise that Turner could fight his own battles, though on balance the latter could not really care less. Nowadays Turner had a new set of supporters and patrons, self-made men of the industrial revolution free from snobbish baggage, men such as the coach builder BG Windus, the whaling entrepreneur Elhanan Bicknell and Thomas Griffith of Norwood. (It was at the latter's home that Turner first met Ruskin in June 1840.)

In August of 1836, he toured France and Switzerland with his friend Hugh Munro of Novar. The loss of another close friend from his teens, WF Wells, occurred in this year. He was quite ill himself with flu during the winter. When he recovered he made a journey to northern France to make more studies for Scott's *Life of Napoleon*. His visit to Petworth in October would proved to be his last; Lord Egremont was now desperately ill and, as friends gathered, died on 11 November.

Turner still had the Athenaeum Club, a circle of friends in London, Hannah Danby tending his home and studio in London and Sophia Booth in Margate. It was here he spent the summer of 1838 and afterwards produced a whole series of seascapes in watercolour and oil inspired by the visit, clearly relieved the *England and Wales* series had finished.

Before the decade was out he had forty two watercolours and drawings exhibited in Leeds during May and embarked on a tour of Belgium in August.

Turner had achieved new heights of virtuosity during the late 1820s and 1830s with his vignette illustrations but many of the watercolours he painted inspired by his four summer tours of Switzerland between 1841 and 1844 are perhaps rightly considered to be masterpieces in the watercolour medium. One of these works which I believe to be indicative of the whole series, *The Dark Rigi* (1842) is examined in detail in Chapter VIII.

Before he began this series of tours, in August 1840 he journeyed along the Rhine and Mosel and on to Venice for the last time. A fellow tourist in Venice, the painter William Callow (1812-1908) felt guilty as he watched Turner working so late whilst he idled.

On the back of one watercolour, *Venice from Fusina* (see fig. 39), Turner scribbled "gleam of the last of the [?] ray", his final farewell to the crumbling city. He returned via Munich and Coburg to London on 6 October.

Even as he approached 70 and his health troubled him more, he produced oil masterpieces such as *Rain, Steam and Speed*, the Great Western Railway exhibition RA (1844) and *Norham Castle* (circa 1845).

He still managed to visit the RA and friends such as Clara Wells, the Eastlakes – Charles Eastlake's translation of Goethe's *Farbenlehre*, Theory of Colours (published 1840) he read and annotated – Carrick Moore's, the Rogers', the painter John Martin and Ruskin's family with whom he stayed sometimes.

In 1843 Ruskin's *Modern Painters* was published; Turner remained ambiguous about it, telling a friend, Mary Lloyd, "he sees more in my pictures than I ever painted". "But he seemed very much pleased", she added.

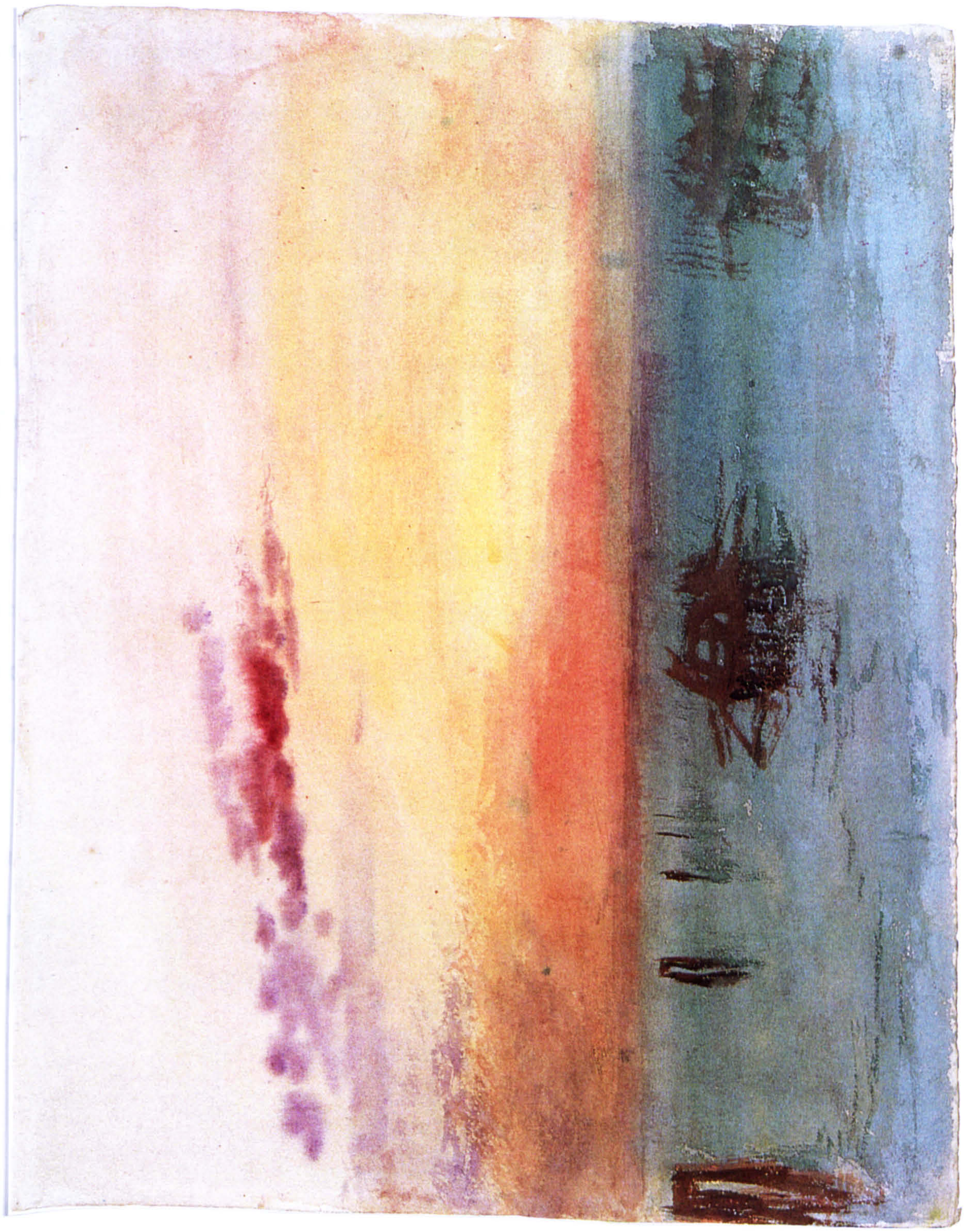

Fig. 39

It was also during 1847-1849 that the photographer JJE Mayall recalls Turner coming into his shop in the West Strand not threatened by the new technology but fascinated with it. Here they discussed experiments with light and Mary Somerville's attempts at magnetising a needle with spectral colours (see following chapter).

Turner's last four oils were painted in his Chelsea home. Still inspired by the Aeneid and the tribulations of Dido and Aeneas, they were exhibited at the RA in May 1850.

By this date his health was much on the wane. Even in his last year, 1851, he still managed to visit the Crystal Palace under construction for the Great Exhibition, during January; the RA dinner on 7 May, as well as varnishing day and private views. It is possible that he painted his last watercolours around this date, *Lake of Thun*, *Florence* and *Genoa*. By October however his health had deteriorated so rapidly that he was too ill to leave his Chelsea home. Hannah Danby managed to track him down and discovered the house where he was attended by Sophia Booth, Dr Price of Margate and a local dentist-surgeon, Mr Bartlett.

On a gloomy 19 December at 10 am, Turner died peacefully in bed. Both Sophia and Bartlett were there and it is said that just before 9 o'clock the clouds began to break and the sunshine filled his room. He was buried as he wished among fellow artists in the crypt of St Pauls on 30 December.

Chapter III

Seeing the light in Turner's watercolours – dissolving forms, fusing ideas

"He has been particularly successful in seeming to mingle light itself with his colours" – J Landseer, *Review of Publications of Art* (1, 1808:152) (cited by Gage 1987:3).

Though the previous chapter ended in darkness, here I will discuss how and why light was central to making Turner's watercolours work. Indeed many of Turner's watercolours embody in practice theories about light and colour which rode at the forefront of contemporary science in the late eighteenth and early nineteenth centuries.

When it came to searching and finding ideas to increase his arsenal of picture-making techniques, Turner certainly lived out the natural philosopher Francis Bacon's (1561-1626) advice to take our knowledge from different provinces.[1] His lifelong preoccupation with the subject led him through constant experimentation with paper and paints to evolve techniques that seemingly mingled light itself with his colours. The blending of ideas and feelings with the transmuting medium of light was achieved through a graphic secret of his own, a secret whose clues lay in the materials he used for their transmission. They enabled him to create atmospheric moods that transcend time and fuse past and present subjects in a convincingly luminous communion, for example *Lake Nemi* (1840) (fig. 11).

This skill not only set him apart from his peers but helped prevent his work

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[1] Bacon wrote to Lord Burghley in 1592 that he had "as vast contemplative ends as I have moderate civil ends: for I have taken all knowledge to be my province". See AD Burnett *A Thinker for All Seasons; Sir Francis Bacon and his Significance Today* (1999:108, New Century Press, Durham).

from being snared or formulated into a general theory by the expert or connoisseur. That they may have been searching in the wrong direction is implied by William Payne who reminded us in the summer of 1833 that, "Nature is just the same now as when Turner began his artistical life, and he who would be his equal or superior must study the same book".

Sir Humphry Davy (1778-1829), scientist, chemist and poet, speaking when "chemistry was then an almost boundless field encompassing areas that have since been closed off from it and colonised as physics",[2] found a similar connection whilst seeking his own "Parallels between Art and Science" (*The Director*, 1807): "Nature cannot decay: the language of her interpreters will be the same in all times".[3]

Turner himself was of the belief that we can prove nature's superiority "not in theoretical speculation but [in] practical exertions".[4]

The nature and effects of light, colour, heat and matter and their relationship with magnetism, electricity, particle elements, compounds and so on were at the centre of speculation during Turner's era. They threaded through the fields of art and design, science, geology, natural history, astronomy, mathematics, engineering, literature and philosophy, among others, constituting a continuum of knowledge, an interconnected web in which their players roamed freely.[5]

This helped create an atmosphere conducive for creativity and innovation where people could make surprising connections, analogies and metaphors across the fields.

When Turner trawled the landscape with pencil, paper and paints to study

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[2] Hamilton (1998:14).
[3] Hamilton, ibid. (p67-68).
[4] Gage (1969:213), citing Turner's 1810 RA lecture.
[5] Here I paraphrase Hamilton (1997:14-17) and Johnson (1991:543-544).

nature's book, he recorded the changing elements, light, heat and rain and their effects on dense material. Here, he entered a portal through which he could find many tangible and intuitive affinities with any of the above who used nature as their inspiration or school on one hand, or were aware of the imagination's role in the processing of information on the other. One striking demonstration of the importance of the imagination in forming scientific hypothesis is provided by John Dalton (1766-1844).

As a boy, Dalton had kept a meteorological diary recording the ever-changing weather in the Lake District. He proposed that the clouds, mist, rain, streams, rivers and torrents which swept the valleys appeared to be fused as one, yet changed their forms and positions as the result of continuous and minute variations in atmospheric pressure.

Dalton believed it was this youthful pastime in which he intuitively perceived his major discoveries on the unity of matter. For whilst meditating on the effects of such natural phenomena, Dalton was led, step by step, to form a distinct picture in his mind of how the self-repellent particles and "elastic fluids" mixed to form homogeneous matter. For Dalton, nature was dynamic. He outlined his scientific discoveries in his publication *New System of Chemical Philosophy* 1808 onwards.[6]

In Turner's RA lecture "Note on Reflexes and English Landscape" (circa 1810), he states in almost Daltonian terms:

> Among the mutable and infinite contrasts of light and shade, none is so difficult to define or deductible to common vision as reflexes. They enter into every effect in nature, oppose themselves in theory and evade every attempt to reduce them to anything like rule or practicability. What seems one day to be equally governed by one cause is destroyed the next by a different atmosphere. In our variable climate where all the seasons are recognisable in one day,

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[6] Johnston (1991:556-558).

> where all the vapoury turbulence involves the face of things, where nature seems to sport in all her dignity, dispensing incidents for the artist's study and deep revealing more than any other climate, how happily is the landscape painter situated, how roused by every change of nature in every moment, that allows of no languor even in her effects, which she places before him and demands most peremptorily every moment his admiration and investigation to store his mind with every change of time and place.[7]

Nature and her phenomena provided a constant and renewable source of inspiration and interpretation for both artist and scientist. Both could be considered as "experimentalists working as skilfully with their hands as much as their eyes and their brains to explore the physical secrets of the world".[8]

Opportunities for Turner to meet those engaged in the above fields were numerous, especially in London. In addition he had access to knowledge in private libraries as well as to the collection in the British Museum. He lived in Covent Garden until he was 25, a few hundred yards away from the Royal Academy of Arts which he attended from the age of 14, became a member of at 27 in 1802, lectured and taught between 1811 and 1828 and continued exhibiting and other activities there until the end of his life.

The RA was a part of Somerset House until 1837 when it moved to Piccadilly. Under the same roof lived the Royal Society, established to encourage the advancement of natural knowledge along scientific principles, and the Society of Antiquaries, a body of historians and archaeologists who met to discuss the issues of the recent and distant past. Five hundred yards along the Strand stood the Society of Arts, dedicated to the promotion and practical applications of art and natural philosophy.

One example of the lectures given at the RS includes a paper given by Count Rumford "On Methods of measuring the comparative intensities of light emitted by

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[7] Gage (1969:213).
[8] Johnston, ibid. (p626).

luminous bodies" in 1794 which he recommended, "to the contemplation of Philosphers, Opticians and Painters".[9]

Also many of Turner's RA friends, such as Francis Legatt Chantrey, Thomas Phillips, Thomas Lawrence and John Soane were Fellows of the RS and the proximity of the two organisations made it possible for artists and natural philosophers to meet in easy association.

When Turner was 25 he kept house at Harley Street / Queen Anne Street and opened a gallery there in 1804. Though he moved to Sandycombe Lodge, Twickenham (1813-1826) and in later life spent more time at Margate in the 1830s onwards, he maintained the Queen Anne Street property as a base and studio until his death in Chelsea in 1851. His neighbours in the Queen Anne Street vicinity included the poet and banker Samuel Rogers and his wife Sarah. They became close friends; indeed Turner had known him since the 1790s, illustrated his poems *Italy* (1826) and made him executor of his second will. Rogers' home in Hanover Terrace played host to a who's who of scientists and artists of the era. Many of those who attended their house parties over the years are depicted in an engraving by Charles Mottram, *A Breakfast Party at Samuel Rogers' House* (circa 1815). Turner is included alongside the poets Thomas Moore, Thomas Campbell and Byron, whose works he illustrated; Sheridan, Wordsworth, Coleridge, Stothard and Lawrence are also there. Others drawn into this circle included the scientists Sir John Herschel and Michael Faraday who, as we shall see, also met Turner at other places, the mathematician Charles Babbage, who recalled leaving one party with Turner's umbrella by mistake; his surprise however to find a dagger in its handle did not prevent him from inviting Turner to his own gatherings in Dorset Street, Manchester Square. The surgeon James

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[9] Hamilton (1998:12).

Carrick Moore, his daughter Harriet, a friend and hostess to Turner, painted two watercolours of Faraday at work in his laboratory, whilst the scientist and amateur painter, Mary Somerville and her husband Dr William became close friends of Turner's in the late 1820s. Mary frequently visited his studio around 1830 where she recalled she was "always welcomed".[10] All in all, the network appeared endless and interwoven and we will see in the following sections how Faraday and Somerville's ideas resonated in some of Turner's watercolours.

Another key player on the scene, Humphry Davy, shared a whole range of interests in common with Turner. Both were keen fishermen and amateur poets. Davy's pioneering research on colour chemistry helped trigger the field of conservation. He set out his ideas in a lecture to the RS in 1815 entitled "Some Experiments and Observations on the Colours used in Painting by the Ancients". He was not content just to sit and look at their works but was prepared to take careful samples of paint to see how the works worked, research he continued when visiting Italy in 1819.

This line would certainly have interested Turner for he not only experimented with paint recipes himself but was of the firm belief that the old masters had a much better method than the moderns.[11] It may well be that Turner and Davy met in Rome during their visit in 1819; their interests certainly converged. Both shared a mutual friendship with the sculptor Antonio Canova who visited Turner's studio in November 1815 and was instrumental in getting Davy permission to take paint samples from works and met them both in Rome.[12]

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[10] Hamilton (1997:272); see also (p252-253).
[11] Thornbury (1877:124-5).
[12] Hamilton (1997:177).

The Athenaeum Club, of which Turner was a founder member in 1824, was yet another venue the likes of Davy and Babbage frequented; its membership evolved directly out of the societies that met in Somerset House.

Faraday, son of a blacksmith with little formal education, during his youth kept notebooks with observations on life, art and history. It was his notekeeping of Davy's lectures at the Royal Institution that secured him a job as Davy's apprentice and protégé. His interests in geology and botany took him into the landscape; nature became his laboratory. His innovations concerning the fields of force and electricity emerged in large part of his viewing nature as something dynamic, not static or fixed, a theme resonant in Turner's watercolour practice. No mean draughtsman himself, he became further acquainted with Turner in the late 1820s through the lithographer CJ Hullmandel, whom he taught.[13]

Faraday's brother-in-law and an admirer of Turner's work, the watercolourist George Barnard, recalled how they and Royal Academicians such as Stanfield, Westall and Landseer were entertained at one of Hullmandel's soirées by the best Italian singers. On one occasion Faraday said to him, "I wonder you artists don't study the light and colour of the sky more, and try more for effect". "I think this quality in Turner's drawings made him admire them so much. He made Turner's acquaintance at Hullmandel's and afterwards often had applications for him for chemical information about pigments…".[14]

In one of Turner's sketchbooks, labelled "Skies" (circa 1818), there are sixty-five watercolour views that anticipate Faraday's suggestion to Barnard: "The views

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[13] Gertrude M Prescott, in *Faraday Rediscovered* (1985:16) states, "Around 1818 the artist Charles Joseph Hullmandel came to Faraday to study chemistry because he realised that the technical improvements which he envisaged for lithography would depend on a thorough understanding of the chemical properties of the materials employed".
[14] Gage (1987:225) and Hamilton (1998:19).

appear to be the result of looking at the same patch of sky across three consecutive days",[15] in true experimental fashion (see also fig. 48).

Nature provided a constant source of inspiration for the artist, natural philosopher and poet alike. No matter what their angle, new worlds appeared to be opening. Experiments demonstrating the interaction of light, colour and matter were set out in Isaac Newton's (1642-1727) book *Opticks* (1704). He left a whole range of compelling speculation in the concluding queries to this work which inspired many of Turner's generation to continue exploration.

Newton's successor Joseph Priestley (1733-1804) wrote a passage in his *The History and Present State of Electricity* (I, 1775 p. xiv) which summarised the core of speculation which spanned Turner's lifetime.

> Hitherto philosophy has been chiefly conversant about the more sensible properties of bodies; electricity, together with chymistry and the doctrine of light and colours, seems to be giving us an inlet into their internal structure, on which all their sensible properties depend. By pursuing this new light, therefore, the bounds of natural science may possibly be extended beyond what we can now form an idea of. New worlds may open to our view, and the glory of the great Sir Isaac Newton ... be eclipsed.[16]

We will see in this section how Turner struck out a new route in the watercolour medium by pursuing the same old light. Firstly I will briefly outline why Newton was considered such a source of inspiration.

Newton's importance lay not so much in what he did but in how he did it. He invented scientific method by doing experiments to test out theories and hypotheses in practice. His style broadly consisted of thinking on a problem continually till it yielded its secret. His *Principia* (1687), a complex mathematical work, set out the basic rules and laws of motion and explained why they were universal. However his

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[15] Hamilton (1998:63-4).
[16] Knight (1992:39-40): Davy published an "Essay on Heat and Light" in 1799.

Opticks proved a far more accessible work for the layman.[17] The experiments therein were set out in the first person for the novice or expert alike to attempt, building as they did into more complex concepts to inspire replication and further enquiry into how light, colour and matter interacted.

Pursuing light – What is light?

As Turner himself recognised, defending Newton in a marginal note to Goethe's *Theory of Colours* (1840), "One ray suffices to light the world"[18] and all the colour in it. But what is light?

Basically light is what you see.[19] Theoretically what constitutes light is an argument that rages today. That light rays move and can be blocked to create darkness is fact. Light also contains a spectrum of colours, considered a force during Turner's era, later as a form of energy, electromagnetic radiation detected by the eye whose waves or rays can pass through and penetrate materials.

Two theories which have dominated the explanation of light are the particle/corpuscular and wave theories.

Newton recognised both wave and particle aspects of light and explained their behaviour in diffraction. This phenomena can be visualised where a light ray splits, fans out and breaks up, or separates, dilates and rarefies at the edges of shadows or objects, such as a mountain ridge, before sunrise has exploded. These effects find manifold expression in Turner's watercolours cited herein.

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[17] See C Hakfoort, *Let Newton Be* (1989:82); also see *Introduction to Opticks* (1979, Dover reprint): Newton pursued an unofficial curriculum and charted his own course as genius is wont to. His book on *Opticks* is a scientific masterpiece and one of the most readable in the history of physical science and became a crucial link in the chain that led to Albert Einstein as he recognised, "In one person he combined the experimenter, the theorist, the mechanic and not least the artist in exposition".
[18] Gage, *Turner's Annotated Books: Goethe's Theory of Colours* (TS IV, 2, p 39).
[19] ACS Van Heel and CHF Velzel, *What is Light* (1968), Introduction.

Diffraction is not to be confused with refrangibility – though Turner's techniques, like nature itself can blend the two – where light is altered from its original course as it passes from one transparent medium to another, such as a river, cloud, raindrop or a glass prism as Newton demonstrated in 1665/1666:

> Having darkened my chamber and made a small hole in my window shuts, to let in a convenient quantity of the sun's light, I placed my prism at his entrance, that it might be thereby refracted to the opposite wall.[20]

His experiment showed natural sunlight contained a spectrum of seven colours, red, orange, yellow, green, blue, indigo and violet which melt and gradate into each other like watercolour tints. Due to his interest in pursuing notions of universal harmony, he sought analogical relationships between the spectral rays and the seven musical notes, adding Indigo to make them tally. Both were mathematically quantified to reinforce the connection (see fig. 40). However just as there exists a microtonal no-man's-land between the musical notes, Newton was aware that the spectral colours pass into one another by "insensible gradation",[21] an effect Turner referred to as "indefinable tones".

This revealed an instability not only in nature's phenomena but in our own perception of colour, each of us sees colour differently and our judgement of colours, like sounds, are influenced by their neighbouring tones.

Following his prism experiments, Newton refracted the colours from a whole range of transparent substances, animal, vegetable and mineral, which provided an insight into how light and colour suffused matter. Most grew out of and contained water; when distilled and rectified, a great part returned into water and a great part left behind in form of dry fixed earth.[22]

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[20] Newton's *Opticks* (1979 reprint), Introduction.
[21] Gage, *Newton and Painting: Common Denominators in Art and Science* (1981:20-23).
[22] Priestley, see below (p304) and Newton's *Opticks* (1979:270-6).

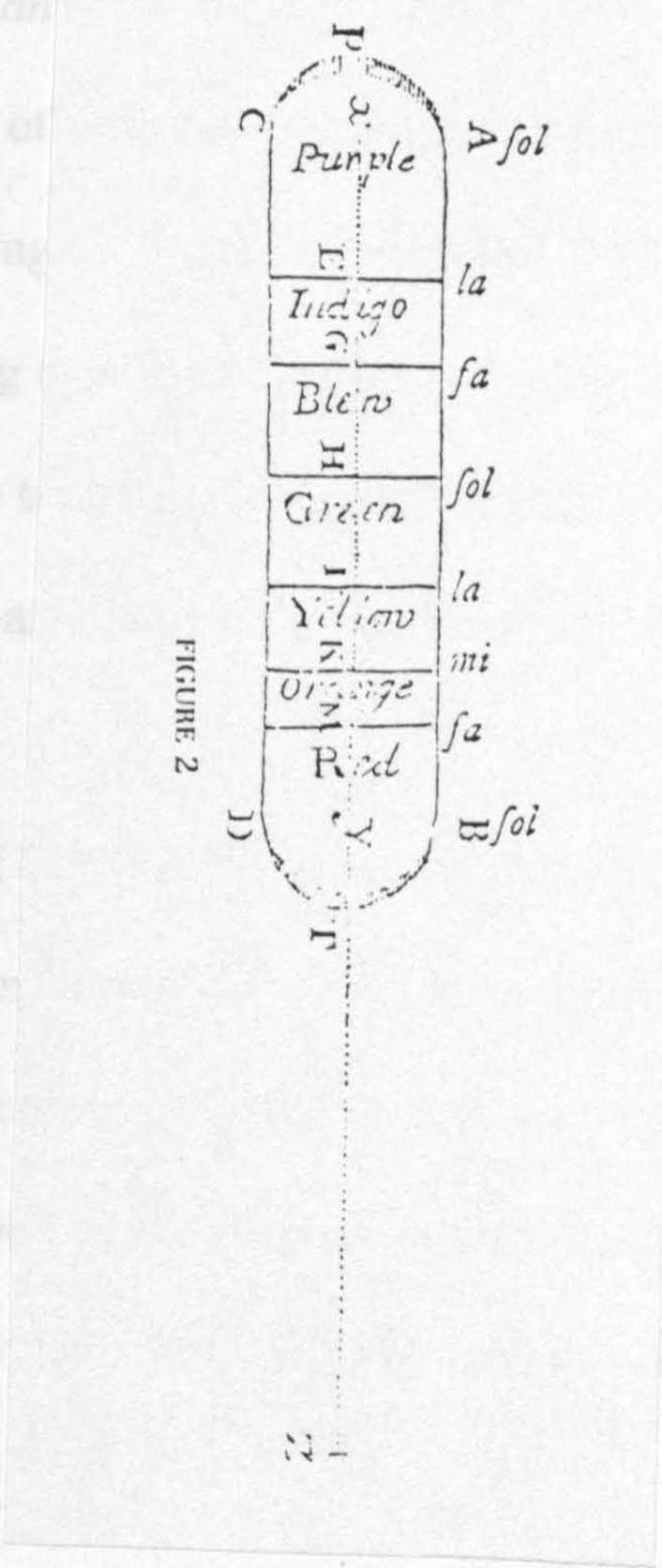

FIGURE 2

Fig. 40

Similarly the link between Turner's use of water, gum binder and powdered pigment to mingle light into his colours is compelling.

In the first lecture of the 1814 series, Turner referred his students to the Newtonian spectrum cited in Joshua Kirby's *Dr Brook Taylor's Method of Perspective Made Easy* (1754).[23] He had access to Newton's *Opticks* and Joseph Priestley's *The History and Present State of Discoveries relating to Vision, Light and Colours* (1772), among other books he trawled through at the British Museum and elsewhere when preparing his lectures. In contrast, he also possessed Thomas Malton Senior's (an old drawing master to Turner) *Complete Treatise on Perspective* (1775) which contained a more traditional Aristotelian idea that colours were a function of "the interaction of light and darkness",[24] an idea Goethe resurrected, as we will see later.

Thomas Young (1773-1829), in *Materials for the History of Colour Theory* (1807), saw himself as extending Newton's ideas on light, aether and sound waves.[25] He discovered that any colour we perceive can be created by mixing together lights of only three different colours, red, green and blue.[26] Reacting to this discovery, the scientist Sir David Brewster (1781-1868) became the intrepid defender of a three-

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[23] Gage (1969:110).
[24] Gage (1987:22).
[25] See GN Cantor, *Optics After Newton* (1983 MVP) for a fuller discussion of Young (p129-146) and Brewster, Fresnel, among others. See also *Let Newton Be* (1989:209-210).
[26] This idea was developed quantitatively in the 1850s by James Clerk Maxwell, whilst Sacks (1997:88-89) states,

> In the twentieth century their discovery not only told us much about light itself but the mechanism of human colour vision. It is through the three different colour receptors in our retina through the visual cortex to the brain, we make visual sense of the world. Thus the seamlessness of perception is not given but has to be achieved in the brain" – *Colour Art and Science* (1997:80-83).

Augustin Fresnel, in the first quarter of the nineteenth century, developed an intensely analytical and mathematical light theory. It centred around a transverse undulating wave theory which exists in an all-pervading luminiferous aether. The observation of the polarisation of light (that is the confining of light waves to a single direction of plane, ie red, green or blue) was crucial in leading to the concept that light consists of transverse waves like waves on the sea. When waves travel along a taut string, the displacement of the string is sideways; that is, in a direction transverse to the direction of propagation of the wave along the string. This defines polarisation of the wave.

colour system of red, yellow and blue as a means of forming Newton's spectrum, which will be discussed later.

Young, whilst observing two ducks on a pond create their respective undulating rippled waves on the surface, noticed where the rings of reflected light interplayed and interfered with each other (see fig. 41). This led him to evolve an experiment in order to replicate the phenomenon, by passing light through two small holes or slits, close together, in a sheet of pasteboard (see fig. 42). The reflections and refractions of light and colour in the landscape and on water's surface fascinated Turner; a keen angler, he had plenty of time to study their interplay.

The subject not only epitomised for Turner "the gap between rules representation and perception",[27] he could find affinities with natural philosophers who grappled with the same.[28] In his 1811 lecture drafts, Turner noted how water's:

> colour… motion… and its reflections admit of such endless variety of incomprehensible contrarities and exhibit such phenomena that it imperiously demands more attention than the dismissal it has generally received.
>
> Water, like other transparent bodies, may be treated the same, it being like a mirror. True, it is a mirror, but of nature's choicest work. Do we ever trace the double tones and prismatic reflected ray of the glass, or do we see the liquid melting reflection, or the gentle breeze that on the surface of the water sleeps…, and
>
> Water often appears dark under a reflected sky, but the mirror under the same sky would be lighter, for it should be recollected that a glass repells only, while water has the double property of absorbing the rays of light and reflecting and refracting.[29]

Though his attempts at translating such phenomena into painterly technique can be found from the 1800s onwards, increasingly refined examples are evident in the 1820s *Rivers, Harbours and Ports Series*, *Norham Castle* (1823) (figs. 3 and 4) especially, right through to the late *Swiss Series*, including *The Dark Rigi* (1842) (fig. 2).

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[27] See Gage (1987:72) and Wyllie (1905:110).
[28] Gage, in *Turner* (1996:124).
[29] Ibid.

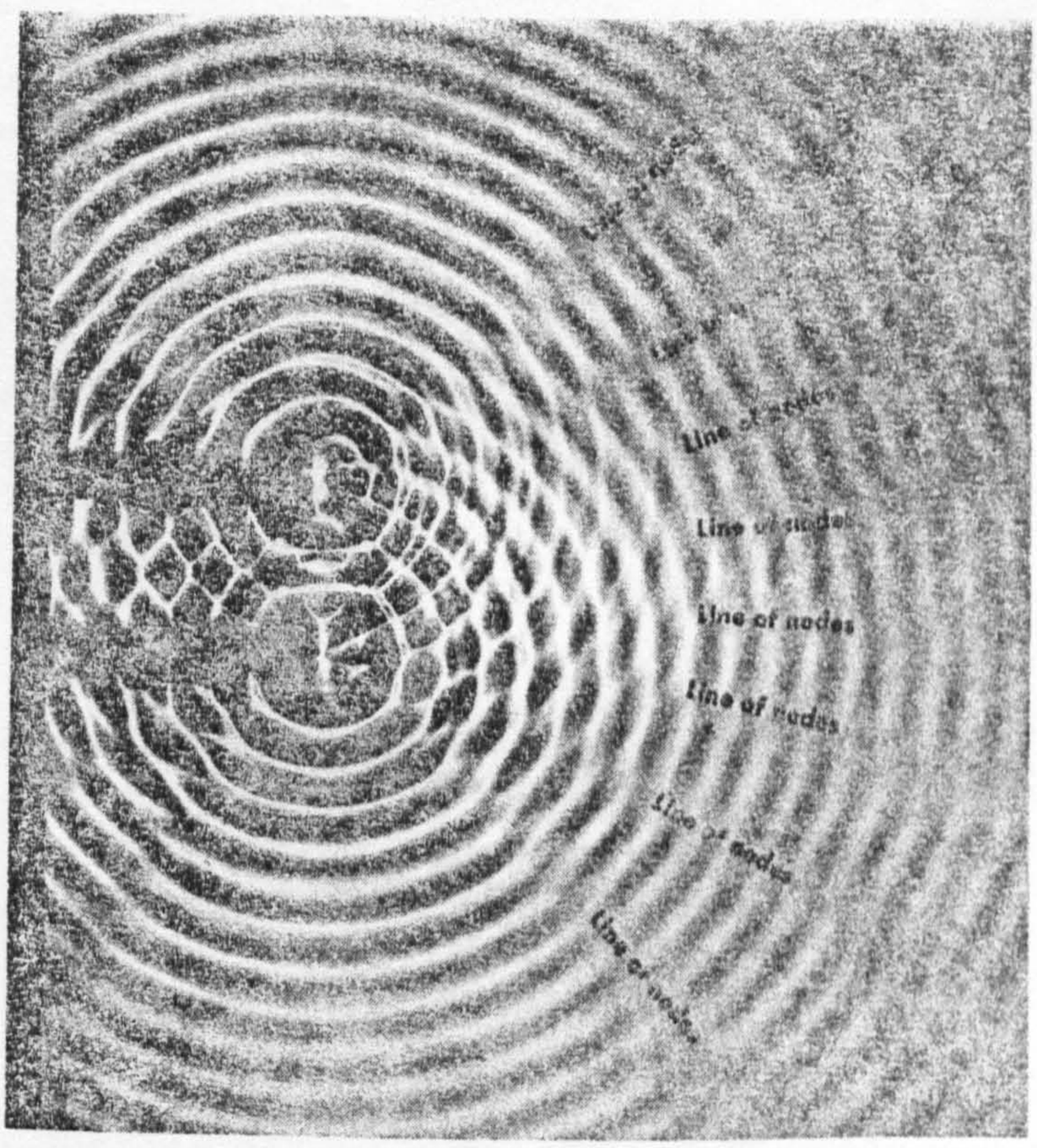

FIGURE 3

The interference of water waves in a ripple tank. The waves are generated by two vibrators that strike the water's surface synchronously, producing two expanding spherical waves. There is destructive interference along the lines marked "lines of nodes" and constructive interference between these lines.

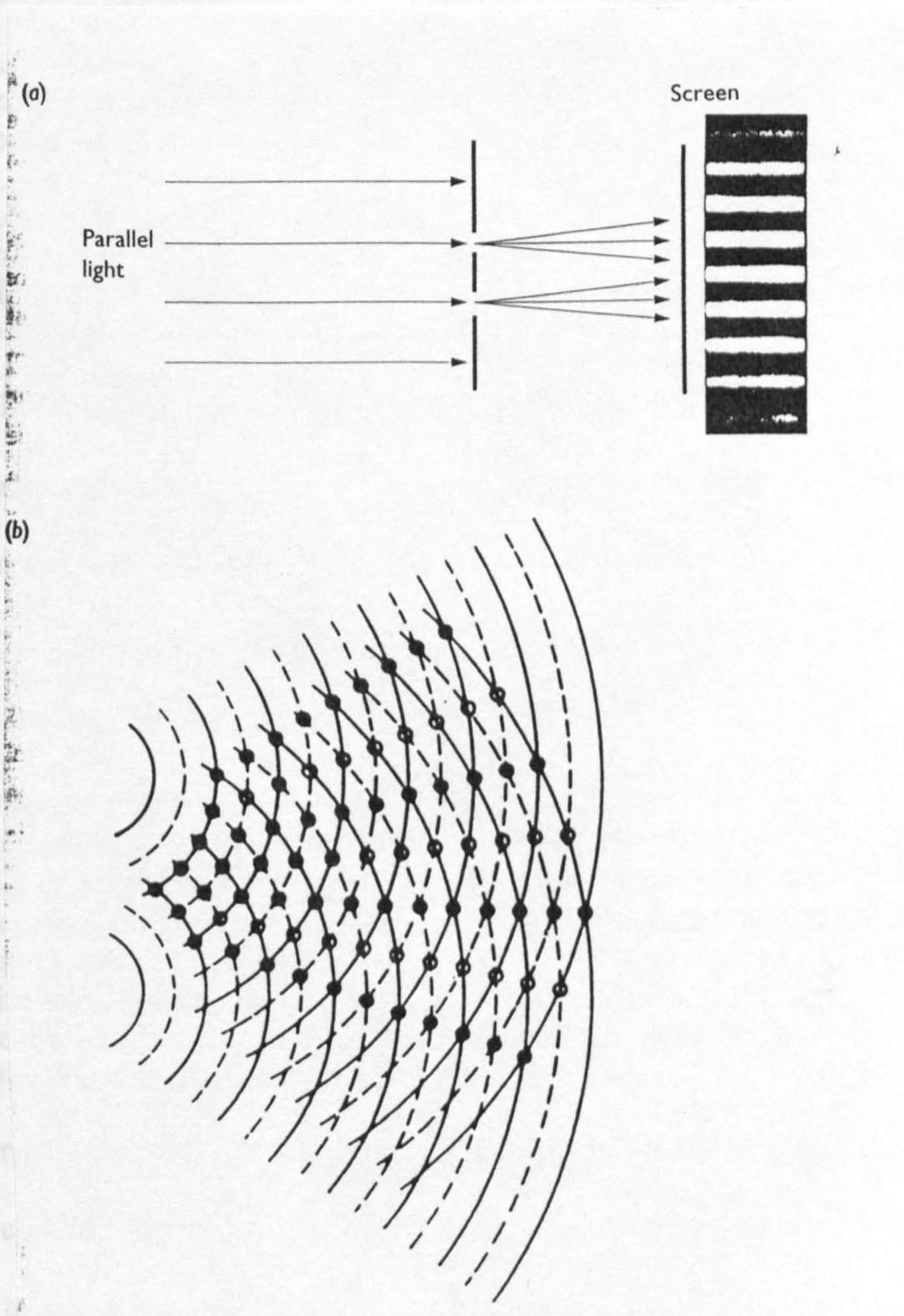

Figure 10 (*a*) and (*b*) Illustrating the interference of light waves in Young's double slit experiment. The waves add up constructively along particular angles and destructively along intermediate angles. This results in the typical interference pattern illustrated at the upper right.

Fig. 42

James Skene, writing in Brewster's *Edinburgh Encyclopedia* (1823:16) under the heading "Painting", spoke of Turner's attempts at capturing the complexities of natural light in watercolour paint:

> … aided by the discoveries daily making in the mysteries of light, his scrutinising genius seems to tremble on the verge of some new discovery in colour, which may prove of the first importance to the art.
> … Turner has struck out a new route by the singular mixture of prismatic colours, with which he represents sky and water; the idea is singularly acute and philosophical, if we consider the optical properties of the changing surface of water [though the] exactness in the minuter parts strictly conformable to the laws of physics seems as yet beyond our reach.[30]

The "minuter parts" of Turner's techniques, namely his use of stippled, hatched and drybrushed pigment particles, to capture the interplay of light and colour, suggested a new route that lay beyond the physics of his era.

The scientist John Gribbin (speaking in *Quantum* R4,1 December 1999) stated that in replicating Young's interference slit experiment:

> You can see patterns of particle light behaviour and also patterns that demonstrate wave light behaviour. But not at the same time. This suggests that not only light theory is in an ambivalent state, but also the world itself, as later research paradoxically shows. In the world of quantum mechanics and subatomic particles (the packets of energy that make up the smallest part of the atom, and this is the deepest description physics has upon the nature of reality) at its core, electrons behave like waves, while at the same time behave like distinct particles.

Instabilities and paradoxes are not only inherent in monochrome light and spectral colours; they can be found in areas of Turner's watercolour where he has evolved techniques to capture the interaction of light, colour and form. Far from being problematic, the above paradoxes signify opportunities for striking out new routes. Here the benefits of considering art and science as imaginative pursuits are evident in both Turner's art and Young's light theory. As Priestley noted in 1775, "the doctrine of light and colours seems to be giving us an inlet into the internal structure of bodies

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[30] Finley (1973:388).

on which all their sensible properties depend" and, aided by developments in electricity and chemistry, they may "open new worlds to our view".

In 1798 Coleridge brought to England Immanuel Kant's transcendental theories and Friedrich Schelling's *Naturphilosophie* for Davy, whom only then had become a friend, to digest.[31] Their works sought to bridge the gulf which existed between spirit and matter and advance upon Newton's laws of motion and attraction set out in his *Principia*. Natural philosophers such as Davy and Faraday, among others, would soon begin to conduct experiments inspired by a theory of forces, all of which were convertible into one another. They were electricity, magnetism, light, heat and any other observable effects governed by the laws of attraction and repulsion. A Dane, Hans-Christian Oersted, worked on Kant and Schelling's notions for twenty years and discovered electromagnetism when he passed an electric current from a battery through a wire and noticed it caused the needle of a compass to twitch in its vicinity when he switched it on and off.

The scientist William Wollaston relayed this fact to his friend Davy; Faraday overheard the conversation and set about absorbing all the knowledge and experiments he could on the subject. Over a period of ten days spread over ten weeks he concerned himself with the problem of how to turn magnetism into electricity. He discovered that if he cut what he later came to call the "lines of force", electricity will be generated. If he cut a high density of them, more will be made and if he moved very quickly, even more so. During the 1830s he became the first to invent a primitive electric motor by placing a magnet in a basin of mercury, complete with a wire and galvanic circuit.[32]

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[31] Kant's *Critique of Pure Reason* (1781) and still more in his *Metaphysical Foundation of Natural Science* (1786).
[32] For a fuller account on Faraday, see Gooding and James, *Faraday Rediscovered* (1985) and G Cantor *Michael Faraday: Sandemanian and Scientist* (1991).

A deeply religious man, he sought to understand the world as God had created it and explain it in common language, aided by demonstrative experiments. He believed that in every one of us there is a living combustion going on inside as in a candle flame, and that all the forces of matter have one common cause. These forces, he believed, obeyed principles of economy, conductivity or least resistance, converging and dispersing as they do throughout nature. He demonstrated the magnetic lines of force visually by placing magnets under sheets of paper scattered with iron filings (see fig. 43).

Crucially he worked out the notion of the field; that is the force of a body's electrical, magnetic or gravitational influence are not confined to their perimeters but extend to the end of space. Thus he believed there was a force in space that we can tap and harness.

Faraday's concerns with light magnetism and matter centred around the interaction of an electric spark and gaseous substances, themselves characteristic of matter.

He proved that magnetic force and light have a relation to each other when he discovered that the state of polarised light rays could be altered by varying the position of electromagnets in their close proximity.[33]

Similar explorations concerning the connection of light, colour and magnetism fascinated another leading scientist, Mary Somerville (1780-1872). A synthesizer and popularizer, a whole range of intellectuals and public alike read her books.

Following Young and Fresnel, she sought to explain light, heat, sound and the movements of fluids in essentially the same undulatory terms. She believed, like Faraday, that force permeates nature.

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[33] Gooding, James, *Faraday Revisited* (1985:145).

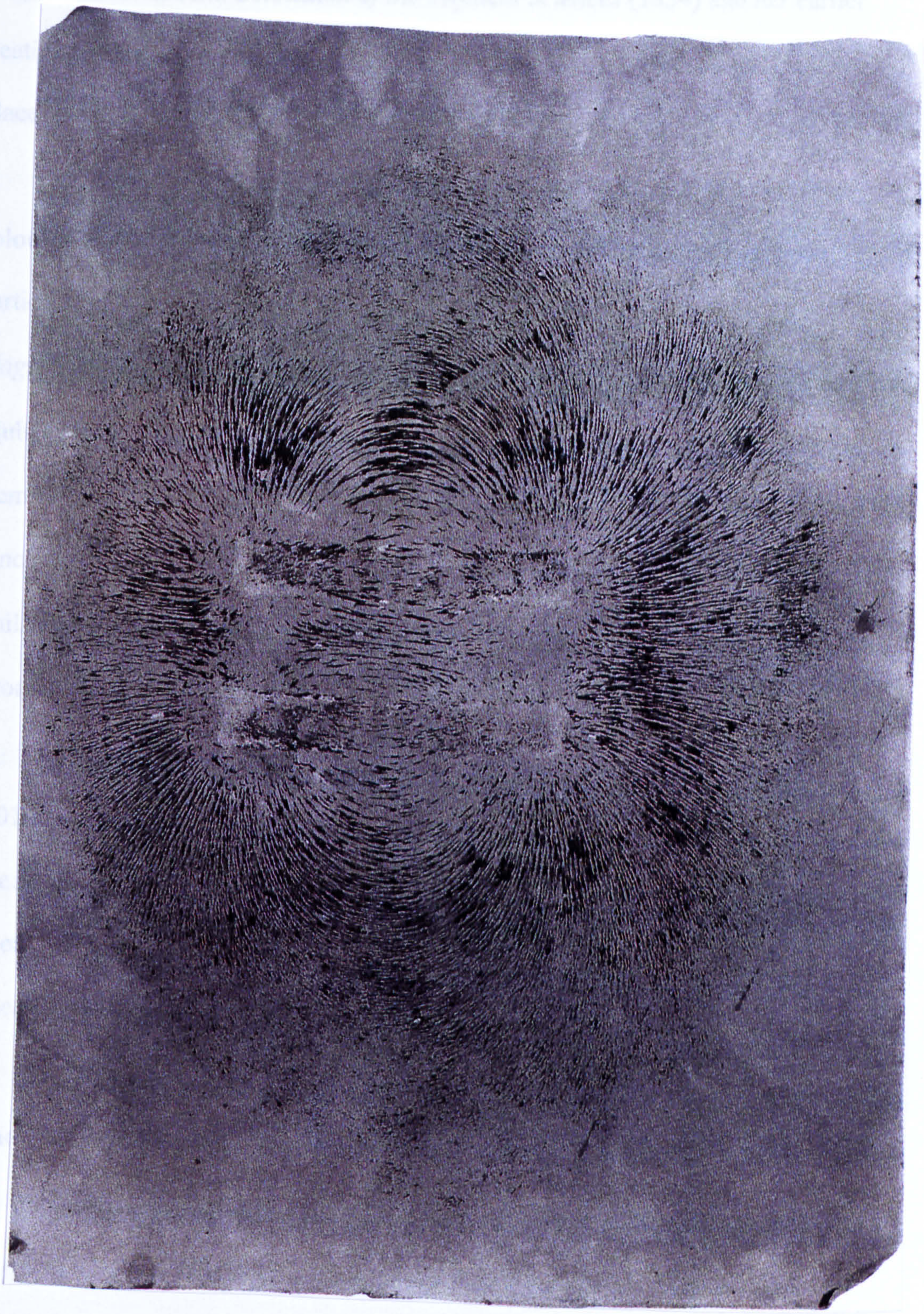

Fig. 43

These ideas formed the basis of her publications which Faraday helped her to get published - *On the Connexion of the Physical Sciences* (1834) and her earlier treatise on astronomy, *Mechanism of the Heavens* (1831), a copy of which found a place in Turner's library.

It was her experiments exploring the magnetising capacity of the spectral colours (an idea proposed in 1813 by the Italian Professor Morichini) which particularly captured Turner's imagination. Her husband read her paper on *The Magnetising Power of the More Refrangible Solar Rays* at the men-only Athenaeum Club on 2 February 1826. She isolated violet rays from the spectrum and allowed them to fix onto metal pieces which she believed magnetised them. Indigo rays, she concluded, had the same magnetising effect; blue and green rays to a lesser degree, whilst red and yellow had no effect. She later withdrew her theory, realising it was erroneous.

In the late 1840s Turner visited the young daguerrotypist JJE Mayall (1813-1901) in his shop on the Strand on numerous occasions. Mayall recalled their discussions centring on light phenomena and Turner asking him if he had ever repeated Somerville's experiments on magnetising a needle in the rays of the spectrum: "I told him I had."[34]

Practical colour theory

Throughout Turner's life, light and colour were expressed as inextricably linked to the forces that suffused nature. We know Turner not only had access to literature on the subject but that he moved in circles where the above notions were discussed. However when it came to translating such ideas into painterly practice, it

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[34] Hamilton (1997:305, 1998:20).

was another matter; any theories he absorbed were tested through his own engagement with nature. Nevertheless there were a whole range of natural philosophers prepared to offer suggestions and even pigments to translate theory into practice. Most, for their own reasons, sought to harmonise and standardise Newton's seven spectral colours with the three material primaries of red, yellow and blue, an idea first asserted by Robert Boyle (1627-1691) during Newton's lifetime.[35]

One, Moses Harris, an engraver and entomologist, outlined his three-colour system in his books *The Natural System of Colours* (1776) and its second edition (1811). Therein he proposed a system of complementing contrasts succinctly illustrated in fig. 44.

Another, James Sowerby, a botanist, mineralogist and scientific illustrator, set out his views in *A New Elucidation of Colours, Original, Prismatic and Material, showing their Concordance in the Three Primitives, Red, Yellow and Blue* (1809). He suggested that "fine dots of the primaries among each other would produce binaries"[36] – what Turner and others knew as secondary and compound colours; they in turn, when mixed, would create the tertiaries.

However, the translation of colour theory into artistic practice became a lifelong obsession for one colourist, philosopher and pigment manufacturer, George Field (1777-1854).[37]

He absorbed Harris and Sowerby's ideas and aimed with some success to produce a standard set of reliable primaries from which could be mixed pure secondaries and tertiaries. This involved replacing many a fugitive pigment such as red carmine, cochineal, gamboge yellow and indigo blue with his own innovations.

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[35] See *Colour* (1980:85).
[36] Kemp, *The Science of Art* (1992:302).
[37] For a fuller account of Field's work, see Gage, *George Field and His Circle* (1989, Cambridge).

Moses Harris, an engraver and entomologist, presented the first detailed colour circle in his book *The Natural System of Colours* (1776) which, despite a scarcity of copies, influenced colour theorists for over 100 years. Harris first of all laid down the three primary or 'primitive' colours (red, yellow and blue) from which he derived three secondary or 'compound' colours (orange, green and purple). Thereafter there were two intermediate colours between each (yellow-orange and orange-yellow came between yellow and orange, for instance) so that an 18-hue 'prismatic' colour circle was formed. Each hue was graded towards the centre in 20 'degrees of power' with the strongest hues innermost; the shading of the circle suggests Harris was anticipating later, three-dimensional models.

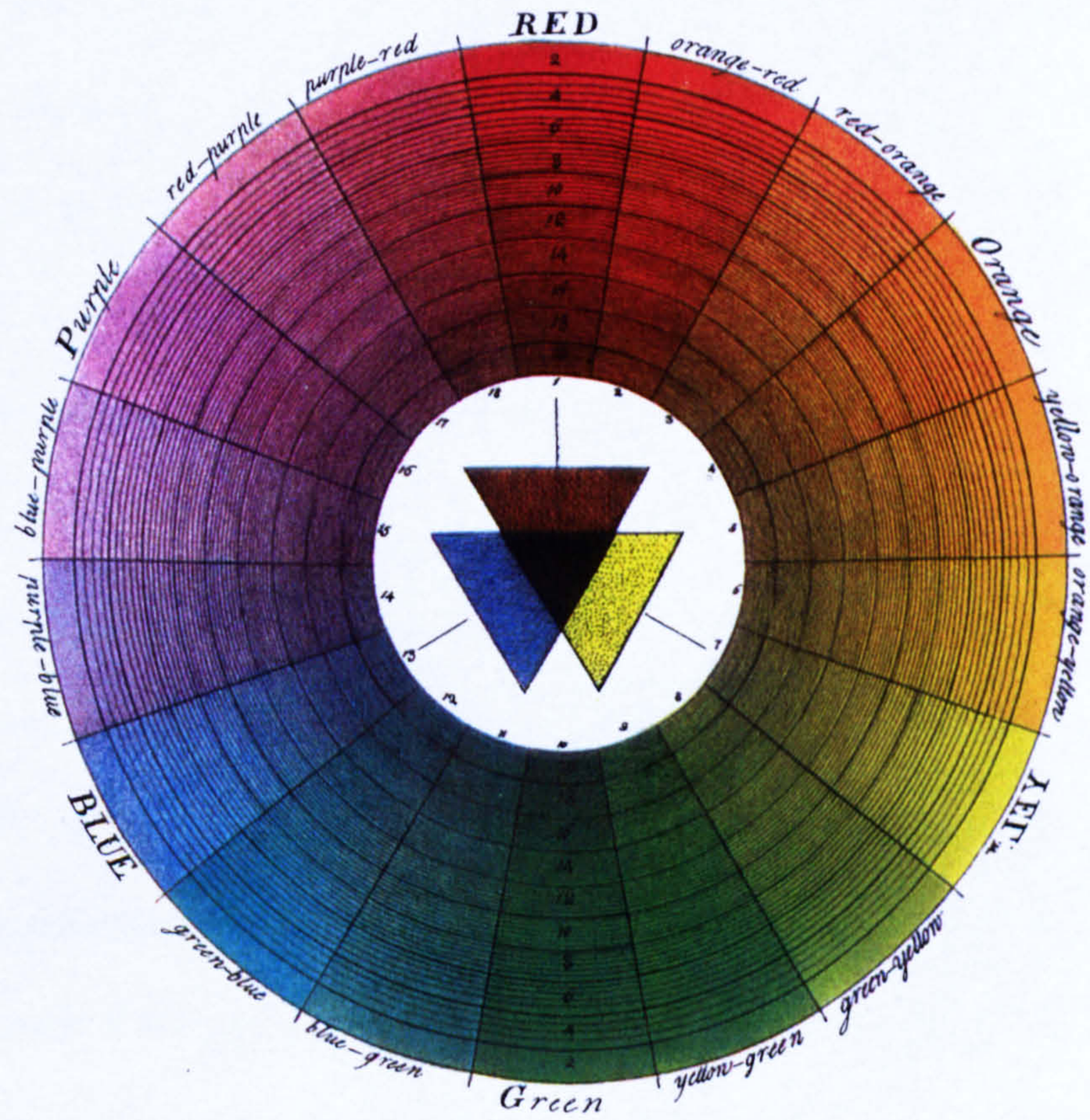

Fig. 44

Harris, in *Natural System of Colours* 1776, had proposed the following paints as representative of the three-colour system: Vermilion for red; the unstable King's yellow (artificial orpiment) for yellow; ultramarine (lapis lazuli) for blue. Sowerby, in *Non-Elucidation of Colours* (1809), proposed: organic red carmine for red; organic gamboge for yellow; Prussian blue for blue.

Field, in *Chromatics* (1817), proposed: madder for red; vegetable based Indian yellow; ultramarine (lapis lazuli) for blue.

However, by the time of his second edition of *Chromatography* (1841), Field had developed: rubic lake red derived from the madder root; lemon yellow ($Ba\ Cr\ O_4$); ultramarine lapis lazuli.

In his *Chromatics* (1808) (Field MSS. f-5 22v), he noted, "The relation of the three principle Earths to the three Primitive colours is remarkable, thus Alumine appears to be the natural basis of Reds, Silex of Blues and Lime of Yellows".[38]

This observation will resonate later in the chapter when discussing Turner's use of the three primaries as representatives of aerial and material colours woven into the texture of natural time and forms.

Field claimed to have studied chemistry with Davy and Faraday[39] and he did keep in regular contact with many of the leading British artists of the day. He knew Turner's youthful friends Thomas Girtin and Reverend Henry Scott Trimmer. It was probably through the latter, Turner's neighbour during the 1820s in Twickenham, that Turner got to know Field personally[40]. He had read Field's *Chromatics* (1817), like many artists of the day, and subscribed to its updated version *Chromatography* (1835) and *Outlines of Analogical Philosophy* (2 volumes, 1839).

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[38] Gage (1989:30).
[39] Ibid. (p58).
[40] Ibid. (p29).

However when Field asked his opinion of *Chromatics*, Turner is reported to have said, "You have not told us too much" and suggested to Trimmer that Field's arguments were "fallacious".[41]

These feelings did not extend to his three-colour system or his notions of polarities, both of which Turner adapted practically, the latter as lights and dark, warm and cool colour groupings for neither could be considered exclusively Field's ideas.

Field's consideration of colour polarities as active at the light end of the scale and passive at the dark derived from his reading of Thomas Thomson's *System of Chemistry* (1802) which introduced him to vitalistic notions of attraction and repulsion extending from material bodies to immaterial light.[42]

Placing a lenticular prism on a black spot enabled Field to demonstrate a prismatic fringe of colours which he believed were indicative of the idea that colours were generated through the interaction of light and darkness. These experiments which were developed as early as 1806, published in *Chromatics* (1817) and *Chromatography* (1835) and can be seen in fig. 45, echoed Aristotle's notion of colour and ideas expressed in Malton's book (1775).

The effects of colour polarities also formed a central theme in Johann Wolfgang Goethe's (1747-1832) *Theory of Colours* (1810), developed a decade or so before Field's experiments. Turner possessed the 1840 translation by his RA colleague and friend Charles Eastlake, which he annotated.[43]

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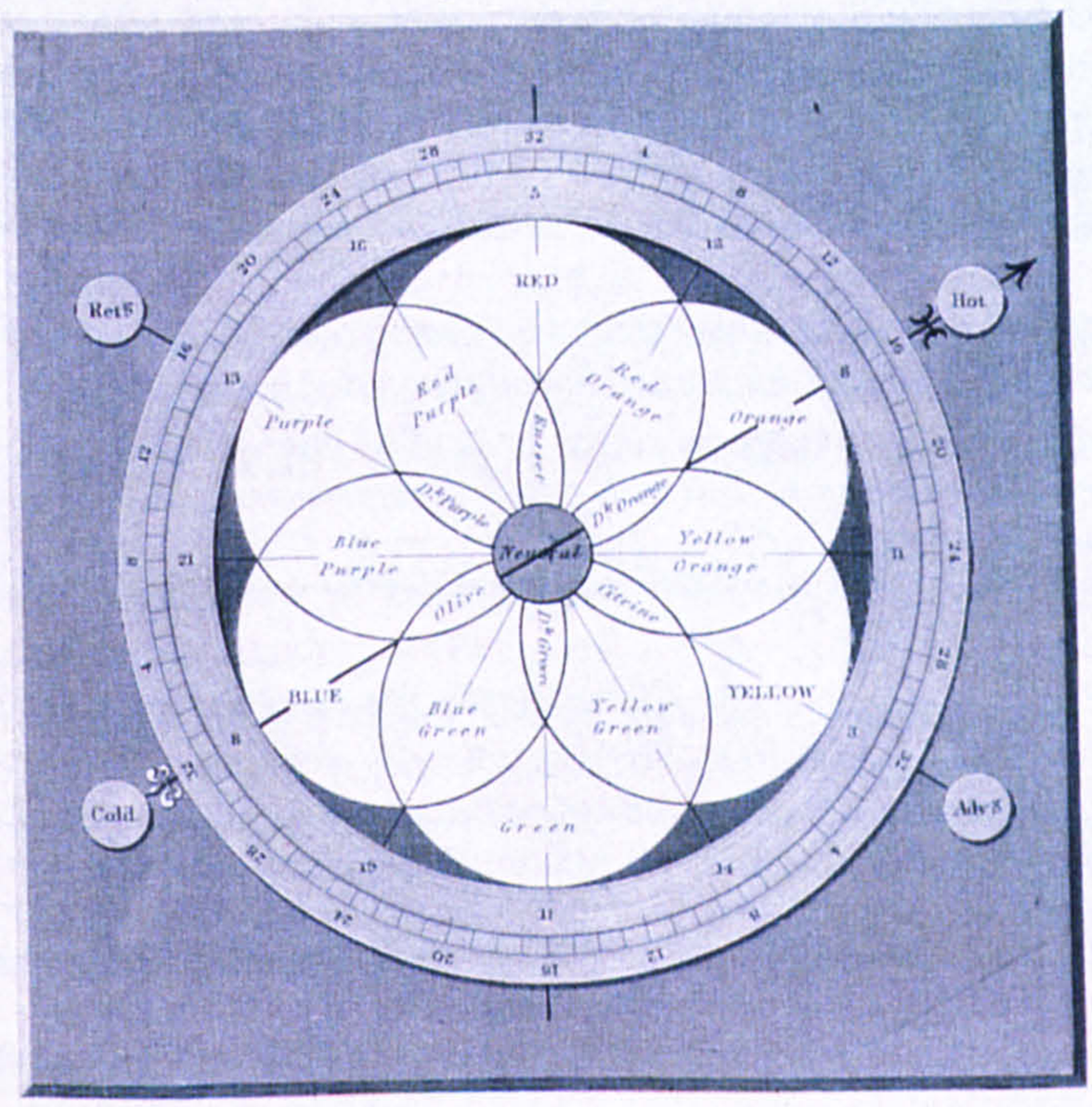
[41] Ibid. (p58).
[42] Gage, ibid. (1898:29).
[43] Gage, ibid. (1989:29).

Fig. I

Experiment I.

Chromatic Equivalents.

Fig. 2. Exp. XXVIII.



Definitive or Fundamental Scale of Colours

Fig. 3

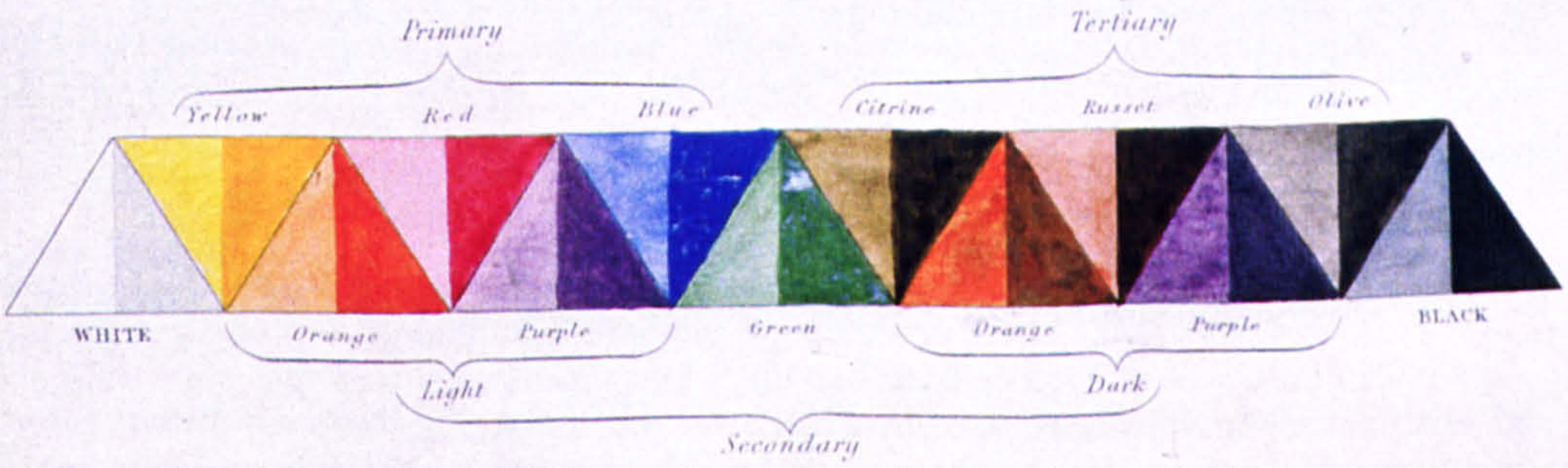


Fig. 45

Goethe's aim was to rescue colour from what he saw as the abstract and dogmatic quantification of Newton's *Opticks*.[44] Though in fairness, Newton quantified for the sake of repeatability and his queries took light into much creative speculation as we see herein.

Goethe interpreted nature as being composed of thousands of "modes", each oscillating within their limit and governed by Kantian dynamics such as "attraction", "repulsion" and "separation" which had inspired Coleridge, Thomson, Davy and Faraday, as we have seen.[45]

In more painterly terms, Goethe proposed that our actual knowledge of solid forms and how we constructed the visual world was shaped by light, shade and colour, the colour of a natural body being nothing more than a function of its predisposition to reflect or absorb the various components of white light. Crucially he concluded that the interaction of the warm, cool colour polarities more nearly revealed these phenomena than the Newtonian spectrum.[46]

As it had for Leonardo da Vinci in the Renaissance, the outside world became a laboratory. Goethe saw nature's processes as analogous to the alchemical transmutation of the elements, and he studied how atmospheric effects could transform fluids, solids and gases and, in the process, reflect, transmit and carry colour.[47]

He observed the iridescent effects of sunlight as it passed through leaves in trees, spiders' webs, through vapours, rain and mist, producing prismatic effects. He noted the complementary colour effects due to different light sources. That is, a violet

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[44] For full transcript, see Gage, *Turner's Annotated Books: Goethe's Theory of Colours* (TS 4 no. 2 p34-52).
[45] The argument has been examined in depth by Sepper, *Goethe Contra Newton* (1988).
[46] Sepper (1988:16).
[47] See RD Gray, *Goethe the Alchemist* (1952, CUP).

shadow produced when the light source was yellow, a bluer shadow appeared when the light source deepened to orange, 'till the red sun produced emerald green shadows.

Thus, for Goethe, like Edwin Land (inventor of the Polaroid camera, 1957), "Optical illusion is optical truth".[48]

The above ideas were set out in a broad *précis* form in the table below, beside which Turner wrote in his copy of the book, "Light and shade".

Plus	Minus
Yellow	Blue
Action	Negation
Light	Shadow
Brightness	Darkness
Force	Weakness
Warmth	Coldness
Proximity	Distance
Repulsion	Attraction
Affinity with acids	Affinity with alkalis[49]

The physicist David Brewster thought Goethe's ideas "utter nonsense".[50] A Newton biographer and intrepid defender of the three-colour system - red, yellow and blue - as a means of formulating Newton's spectrum and light itself, he studied their effects on material bodies and in physical chemistry. Kemp, in *The Science of Art* (1992:301), explains how Brewster maintained this position in the face of Young and Fresnel's trichromacy of red, green and blue.

Passing the spectrum through a piece of purplish-blue glass, he noticed that the orange, yellow and green bands disappeared to leave the blue and red waves. Red

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[48] Sacks (1997:156-157):

> Land used colored lights to project black and white transparencies of a still life taken through filters of these same colours. If only the yellow beam was used, one saw a monochromatic, yellow still life: if only the orange beam was used, a similar, orange monochrome. When both beams were turned on the audience expected something intermediate but what they saw instead was a sudden bursting into full color, with reds, blues, greens, purples, every color in the original still life. Impossible! An illusion!

[49] Gage (TS 4 No.2 p44).

[50] Gage (TS 4 No.2 p34).

and green filters combined failed to eliminate yellow, which instead occupied the area where orange and green had been.

Brewster considered that the purplish-blue glass had absorbed the yellow rays which had been responsible for compounding orange from red and green from blue. He claimed these and other absorption experiments had shown the decomposition of spectral orange and green into yellow, red and blue components.

Brewster also chose to group his colours into two distinct polarities, red, orange and yellow because of the brilliance; blue, indigo, violet because of their darkness. His work on the polarisation of light led to his invention of the kaleidoscope (circa 1814) to which Turner made passing marginal references in his lectures from 1818 onwards,[51] whilst his article "Optics" in the *Edinburgh Encyclopedia* (1822) assimilated Young and Fresnel's ideas on interference.[52]

Colour diagrams (watermarked 1822) which Turner used as illustrations in his lectures circa 1825 anticipate Brewster's ideas on the subject as set out in his *Optics* (see figs. 46 and 47). However the consideration of yellow as the closest to the fundamental white light, and therefore at the apex of the triad, was nothing new. There has been much speculation about contacts and intermediaries who may have conveyed such notions between Brewster and Turner, and indeed about when the two met; Brewster himself is on record stating it was in Edinburgh, 1834.[53]

The following succinctly focuses Turner's interests in the subject. Thornbury suggests that Turner and Brewster met in the artist John Thompson's circle of artists and Scottish intellectuals in 1818 or 1822 and that they,

> ... would constantly battle ... upon the subject of light, trying to gain from Brewster and other savants information thereon;... To such a height, indeed, did [Turner] carry the verbal contests that the subject, it is said, finally was

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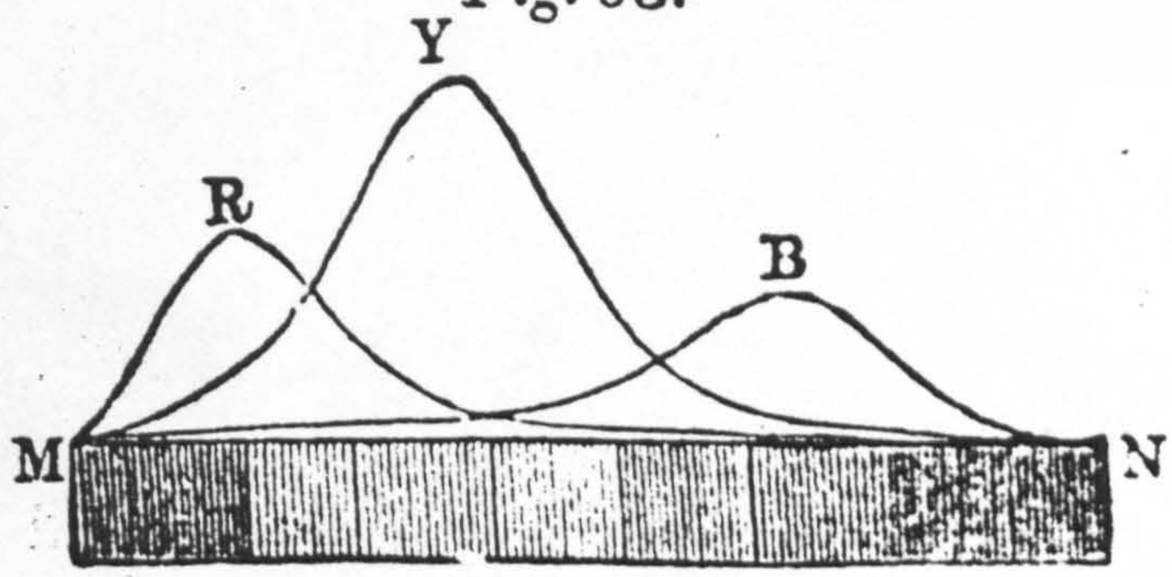
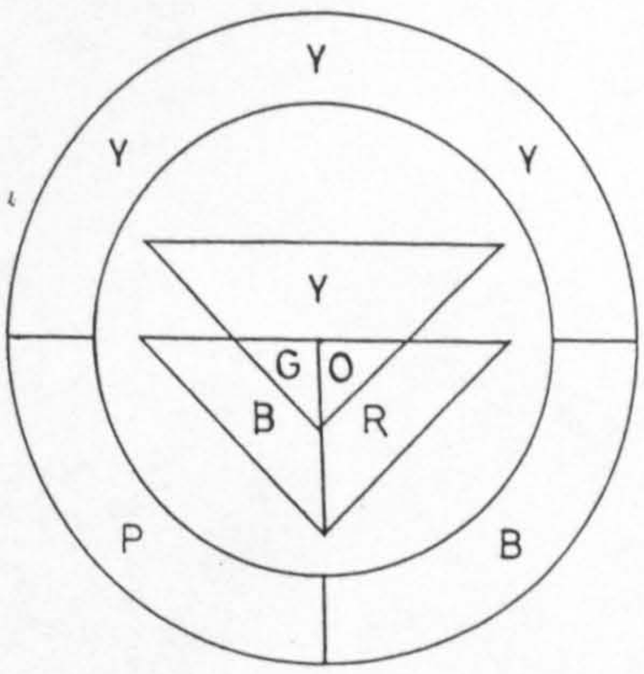
[51] Hamilton (1997:215).
[52] Cantor, ibid. (p160).
[53] Hamilton, ibid. (p215).

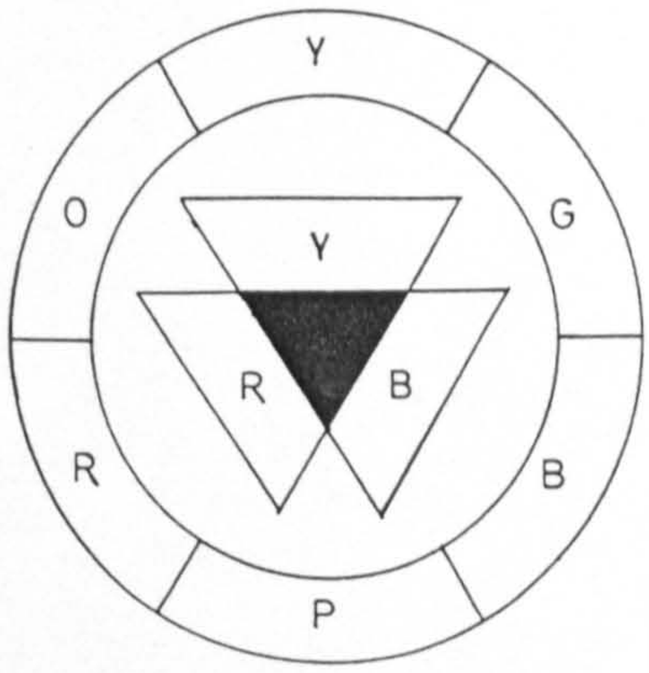
Fig. 46

Fig. 53.



525. Production of the spectrum from three primaries, from David Brewster's *A Treatise on Optics*, London, 1831.





526. The 'aerial' and 'material' colours as described by Turner.

Y—yellow	R—red	O—orange
B—blue	G—green	P—purple?

527. 'Weighting' of the colours in a wheel as described by Turner.

Y—yellow	B—blue	R—red
G—green	O—orange	P—purple?

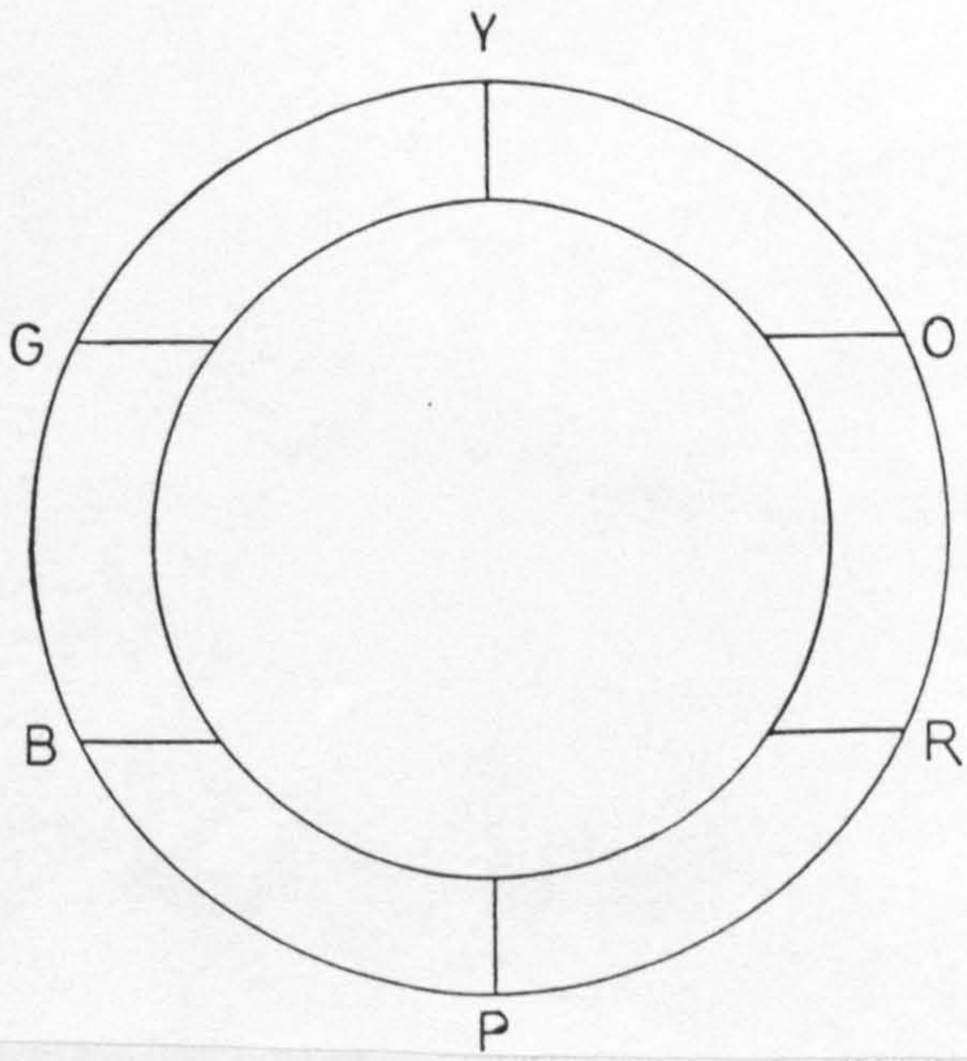


Fig. 47

> prohibited; and then he became more earnest to discover what combination of colour would produce light.[54]

Though Turner employed the three-colour system of red, yellow and blue as a central core in his practice and lectures, he did not adhere to three specific pigments to translate these primaries or to mix into secondaries and tertiaries. Instead he used a whole range of different pigments (see figs. 88 and 96) in the same colour class, each with their own transparent or opaque characteristics, sometimes both. For example, in the blue class, cobalts, Prussian, ultramarine, indigo and the same applied for reds and yellows.

Combined, these pigments could produce an almost infinite range of tints and textures. This was evident in the *Through Switzerland with Turner* exhibition of 1840s watercolour studies, displayed in the Clore Gallery, 1995.[55] Therein during practice, prescriptive colour theories went out of the window; replaced with instinct and energy (see figs. 127-131), the paint became a world in itself.

Just how watercolour paint could become a world in itself will become clearer in the following section.

Turner: light into paint

Gage sums up succinctly Turner's belief that the three primaries were "seen to be woven into the texture of natural time", and, "the essence of natural structure, of the same order as the basic geometrical forms."[56] In Turner's own words, his fifth lecture, (1818), states,

> But as to tone or strength, comparatively red possesses the utmost power of attracting vision, it being the first ray of light and the first which acknowledges the diminishing of light, tho it is a shade to yellow, as blue is to red. Thus far as (to) primitive strengths; and in aerial (perspective), yellow

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[54] Hamilton, ibid.
[55] See Warrells Catalogue (1995).
[56] Gage (1969:110 and 117).

would be medium, red material, blue distance. White in (the) prismatic order, (as) in the rainbow, is the union or compound (of) light, as daylight; while the commixture of our material colours becomes the opposite, darkness.

Light is therefore colour, and shadow the privation of it by the removal of these rays of colour, or subduction of power; and these are to be found throughout nature in the ruling principles of diurnal variations. The crimson morn, the yellow morning golden sunrise and red departing ray, in ever changing combination, are constantly found to be by the subduction or inversion of (the) rays or their tangents.

These are the pure combinations of aerial colours; the dense material of white (the) adventitious or pictorial means, the means of the gradation of colours. Hence arises the quality of its force, and each becomes a light and (a) shadow of its power, comparative to the means; and thence opens an immense field of combinations of the primitive and comparative. Thence it proceeds to the combinations of the dense material colour and the (pictorial) means (of expressing colour). White (is) the substitute of light, as it is the compound in aerial light; the very inverse of colourable materials mixed produces strength or weakness, lightness or, (when) equal each to each, the destruction of colour: to one the tone of colour, (to the other), corruption of colour. The science of art and her combinations (is) colouring, not colour, and here we are left by theory, and where we ought to be left, for the working of genius or the exercise of talent.[57]

The one ray that lit the world revealed its spectrum in the sky from morning to night through the vaporous and aqueous mediums in the atmosphere, for clouds, mists and rainbows are nature's prisms. Lakes, rivers and seas and the dense material of the landscape, its terrain and foliage, also contained their compounds and teriaries, orange, green, purple and olive citrine, russet, not to mention the whole range of greys, browns and blacks. This array of colours combined the effects of diffracted, refracted and reflected light with the chemical pigments inherent in the process of photosynthesis and the mineral elements.

The red in iron oxides, clays, soil and departing rays, the yellow medium, sandstones, sulphur, lime and ochres and the distant blue sky reflected in aqueous

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[57] Turner's lecture notes, Lecture V (1818, BM Add, MS 46151, H, ff 25v-41v); see Gage, *Colour in Turner* (pp202-209) and Finley, *Turner's Colour and Optics* (p389).

mediums and found in slate and stone.[58]

Cennino Cennini, in his famous *Craftsman's Handbook* (1390) proposed that many pigments such as ultramarine blue, cinnabar vermilion, yellow, red and purple ochres and so on, were formed alchemically in the bowels of the earth. Turner's use of these pigments as pure aerials and material colours, resembled the alchemists maxim of "what is below is like what is above" and vice versa[59] on one hand, and confirmed practically that the three-colour system of red, yellow and blue was woven into the texture of natural time and forms on the other.

His library held William Salmon's *Polygraphice* (1675) which contains in-depth alchemical paint recipes and analogies along the same lines. Alchemical paint technology itself mirrored nature's processes.[60]

The same pigments were often sublimated – heated until vaporised, calcinated - reduced to fine powder, distilled into a vapour by boiling, then condensed back into a liquid by cooling, among a host of procedures to purify, separate and recombine the particle elements.

Prussian 'iron' blue, a pigment synthesised chemically (circa 1704, Berlin), triggered modern paint technology and became a central colour in Turner's palette. He introduced it into his skies because he felt it was "nearer nature"[61], though it must be stressed that the minerals ultramarine and cobalt were equally favoured for this purpose.

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[58] Thomas Young, *Materials for the History of Colour Theory* (1807), discovered that wavelength and colour are closely linked. The frequency of vibration correlated with that of colours, for example, red corresponds to the highest frequency, blue to the lowest. In 1814 the German, Joseph Fraunhofer, saw black lines in the reflected spectrum. This provided new information on the chemical structure of the universe. Later in the nineteenth and twentieth centuries, these ideas were developed under the umbrella of spectroscopy. Thus each chemical element has its own spectra fingerprint which can be detected in nature's minerals, plants, gases, metals and so on.

[59] F Sherwood Taylor, *The Alchemists* (1976:77, Paladin).

[60] See A Wallert "Alchemy and Medieval Art Technology", *Alchemy Revisited* (1990:154-161).

[61] Thornbury (1877:124-125).

Vermilion red contained a sulphur mercury sublimate, whilst yellow and red ochres, oxides, chromates and vegetable pigments, particularly madders and indigo, are all evident in his colour boxes and watercolours.

As he scanned the landscape, he could see how nature combined and corrupted these colours through her ever-changing atmospheric moods, or modes, as the elements changed their forms and positions between the aerial and dense material.

Light penetrated, dissolved and recombined their forms and colours; nature could be seen as something dynamic, as Newton inferred in Quest 30, *Opticks*:

> The changing of Bodies into Light, and Light into Bodies, is very conformable to the Course of Nature, which seems delighted with Transmutations. Water, which is a very fluid, tasteless Salt, she changes into Vapour, which is a sort of Air, and by Cold into Ice, which is a hard, pellucid, brittle, fusible Stone; and this Stone returns into Water by Heat, and Vapour returns into Water by Cold. Earth by Heat becomes Fire, and by Cold returns into Earth. Dense Bodies by Fermentation rarify into several sorts of Air, and this Air by Fermentation, and sometimes without it, returns into dense Bodies. [Thus…] And among such various and strange Transmutations, why may not Nature change Bodies into Light, and Light into Bodies?[62]

Using the pigments, gum mediums and papers that he did, Turner could realise the "strange transmutations" nature and his imagination supplied. In his hands, light became a central, luminous force that suffused his subjects, forms and colours; combined with the effects of shade, they transcended time itself.

The reader may still be perplexed as to how Turner can refer to the dense material of white as underpinning this system. The source of this system, we will remind ourselves, is Newton himself who sometimes imagined that the rays of the spectrum are like grains of powder or sand that, when combined, are still actually present in the mixture. Yet the perceived result of colour mixing is more like a chemical combination in which the constituents lose their separate identities and

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[62] *Opticks* (1979:374-375, Dover reprint).

qualities than like a mechanical mixture; to conceive this appropriately requires a more dynamic way of understanding the phenomena.[63]

Using chemical pigments, natural light and paper, in experiment 15, *Opticks*, Newton vividly demonstrates this phenomenon:

> Lastly, in attempting to compound a white, by mixing the coloured Powders which Painters use, I consider'd that all colour'd Powders do suppress and stop in them a very considerable Part of the Light by which they are illuminated. For they become colour'd by reflecting the Light of their own Colours more copiously, and that of all other Colours more sparingly, and yet they do not reflect the Light of their own Colours so copiously as white Bodies do.

Newton then goes on to describe how the red spectral ray from the prism projected in his dark chamber onto a patch of red lead painted next to a blank white piece of paper makes the paper appear brighter as the red ray is absorbed more in the red lead and the paper reflects the red-making rays more copiously. The same applies when the other colours are projected in the same manner. Thus a blue pigment will absorb all the colours in the spectrum of white light other than blue; the same law applies for red, yellow, green, and so on.[64]

He then describes mixing red lead and viride aeris (green) to produce colours like dust and dirt. Then mixing blue bise and red lead, a colour verging on purple, adding orpiment yellow to create a pale red, then a little more viride aeris and blue bise, until it became a grey or pale white. He concludes each of these colours by increasing their light can be brought to perfect whiteness, from which they arise.

Newton then flips the phenomenon back into itself. He rubs the above mixture of grey powder on the floor of his chamber beneath the sun's rays and places a piece of white paper in the shadow and shade from the light of the clouds next to it; the grey powder appeared intensely white. Summarising, he states,

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[63] Sepper (1988:146).
[64] JD Barrow, *The Artful Universe* (1996:10, Oxford University Press).

Now, if you consider, that this White of the Powder in the Sun-shine was compounded of the Colours which the component Powders (Orpiment, Purple, Bise, and Viride Aeris) have in the same Sun-shine, you must acknowledge by this Experiment, as well as by the former, that perfect Whiteness may be compounded of Colours.

From what has been said, it is also evident, that the Whiteness of the Sun's Light is compounded of all the Colours wherewith the several sorts of Rays whereof that Light consists, when by their several Refrangibilities they are separated from one another do tinge Paper or any other white Body whereon they fall. For those Colours (by Prop II, Part 2) are unchangeable, and whenever all those Rays with those their Colours are mix'd again, they reproduce the same White Light as before.[65]

Turner had an even more dynamic way of conveying light phenomena. Pure aerial rays became transmuted into "sublime conceptions"[66] of dense material form. The watercolour paint itself became a matrix of elements suspended in a fluid medium. In many alchemical texts gum (arabic, for example) is considered analogous to the "the glue of the world", a transforming substance, a medium between aerial spirit and earthy bodies, which "fixed what runs".[67] The gum finds its place among other substances in Newton's refractive index as being between those of "earthy substances and water".[68]

Turner drove the watercolour paint around until he'd expressed the idea in mind. His energy, skill and imagination composed the effects of colour and converted light into bodies and bodies into light. With both the associative and tangible qualities of colour he had access albeit in a symbolic fashion to the building blocks of nature. The pigments' particles themselves moved around in constant oscillation until they settled and dried amid the papers multifarious surface texture – the effect can be

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[65] *Opticks* (1979:150-154, Dover).
[66] Turner's RA Lecture VI (1812) cited by Gage (1969: 200).
[67] See CG Jung, *Psychology and Alchemy* (1980:161 and 178, RKP).
[68] *Opticks* (1979:272-274).

likened to the vital essence of Brownian motion.[69]

The force and effects of light not only found a central place in his art, they remain essential elements in what makes a watercolour work. Goethe, in his *Theory of Colours* (1810:233, Section S83), noted,

> Thus every colour, in order to be seen, must have a light within or behind it. Hence the lighter and brighter the grounds are, the more brilliant the colours appear. If we pass lac-varnish over a shining white metal surface, as the so-called foils are prepared, the splendour of the colour is displayed by this internally reflected light as powerfully as in any prismatic experiment; nay, the force of the physical colours is owing principally to the circumstance that light is always acting with and behind them.

Turner made scattered notes and diagrams throughout his 1840 English translation of this book and, next to the above section, he recognised "thus paper as the acting-ground in Watercolours, White in Oil Colours".[70]

The dense fibre structure inherent in the papers he used, reflected rather than absorbed light through the transparent and semi-transparent paint films. For example, a thin coat of madder red appears bluish on such a surface whilst a thick coat of madder takes on a scarlet hue, creating, if the two are combined, contrast and luminosity in one colour. Together with his use of opaque bodycolour/gouache paint where "light" was added by the addition of white paint (often lead or barium white) using the techniques outlined in Chapter VII he could create a whole range of tonal recessions, gradations and contrasts necessary to establish an image. They formed the basis of his technical arsenal for which his power in the medium depended. In Faradayan terms, "Tensions of light energy entered his colours and composed his

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[69] Robert Brown (1773-1858) examined pollen in water between glass slides under a microscope, and saw particles moving. He wondered if this was but one illustration of the vital essence of life and proceeded to examine ink, milk, mucus, coal dust and particles from the Sphinx! Later in the century James Clerk Maxwell deduced the hotter the liquid the faster the particles move, whilst Albert Einstein in the early twentieth showed that particles and molecules do exist and did the maths to prove it. See also Cohn (1977:16 and 40).

[70] For full transcription, see Gage, *Turner's Annotated Books: Goethes' Theory of Colours* (TS Vol. 4, No. 2:34-52).

forms, like fields of force assembling and constructing life out of its minute gradations".[71]

Faraday's brother-in-law, the watercolourist George Barnard, in a later edition of his book (1861:127-128), makes a direct reference to the crucial influence handmade papers had on Turner's watercolour style, including his ability to translate natural phenomena and scientific ideas into painterly technique. He states,

> Look well at Turner's watercolour drawings in the two styles, as they hang side by side in the National Gallery. Compare *Moor Park*, done in the early transparent manner, without opaque white, on white paper, with the *Rivers of France*, on gray paper, in which body colour is profusely used. *Not only is there a truer transparency in the old method, but actually more sunlight and far more reflected light. Once more, let us examine the texture it permits us to give our different distances and substances. Now in our opinion, and also, we believe, in that of many others, the peculiar grain or granulation of a rather coarse paper has always been considered as greatly assisting in giving an appearance of atmosphere – the pure, transparent, palpitating fluid floating over the whole earth: air, as it often is even in moist England not mist or white fog, or too much vapour.* We believe, we say, that the varied prominences and depressions found in this kind of white paper (when covered with transparent tints, and viewed in different lights, which tints are again varied by being partially rubbed off the prominences, or which have slightly settled into the depressions) produce a play or alternation of light and shade that, combined with hatching and stippling, penetrates into space and darkness than the mealy dusty grain of Chinese white even if it does not alter.

Turner's watercolour *The Dark Rigi* (1842) (examined in detail in Chapter VIII; see figs. 2 and 140-142) will serve as a summary to this chapter for the following reasons.

I believe any light and colour theory Turner absorbed, albeit tempered with a lifetime observing landscape phenomena, would surface in such a complex work, considering it was painted more for his own pleasure than for the whims of the patron and market.

Sustained study of this work at the Laing Gallery, Newcastle, has shown that it

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[71] Here I paraphrase Jack Lindsay (1966:203-204, 217-218).

shares the same technical make-up of its two companions in the late *Swiss Series*, *The Blue* and *The Red Rigi* – among the most innovative ever produced in the medium. Also evident is Turner's hard won knowledge of what constituted the most suitable paper, gums and paints to convey his ideas. This technical knowledge, matched with his skill and imagination, enabled him to blend and transmit seemingly divergent and obsolete notions with more contemporary ideas concerning the nature of light and colour.

The English translation of Goethe's *Theory of Colours* (1810) was hot off the press in 1840, only two years before this work was painted and Turner's annotations in the margins show he still had a vivid and practical understanding of Newton's ideas as much as his would-be nemesis.

However the observations of an earlier natural philosopher, Joseph Priestley (1772:447) will serve to introduce the transition of aerial tints from which the force of *The Dark Rigi* and its companions were formed.[72]

> Is it not, therefore, natural to imagine that, as the sun's light becomes always somewhat yellowish, or orange, in passing through the depth of the atmosphere horizontally, it ought to incline more and more from orange towards red, by passing through a still greater tract of air; so that the clouds, according to their different altitudes, may assume all the variety of colours at sun rising and setting by barely reflecting the sun's incident light as they receive it?
>
> Our author was confirmed in this opinion by frequently observing, when he was in Switzerland, that the snowy summits of the Alps turned more and more reddish after sunset in the same manner as the clouds, and he observes that what makes the same colours much more rich and copious in the clouds is their semi-transparency joined with the obliquity of their situation.

The sunrise ignites the transparent aerial tones behind the Rigi and, like the turning of a kaleidoscope, they alter its appearance. *The Dark Rigi*'s principal ray of chrome yellow is suffused with waves of dense material white, possibly lead. This

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[72] Kraus reprint Co. Millwood, (1978, New York). See also Gage (TS Vol. 4, No. 2: 52 f21).

yellow medium melts into translucent bands of orange, red, cobalt and Prussian blue vapours which disperse about its summit.

Successive tints of these colours are combined to produce the dense material forms of the mountain, its base and the lake. Any tone with insufficient force is reinforced with an opaque touch of colour in the same class, yellow ochre for example in the terrain of the mountain base, mingles with madder reds, cobalt and Prussian blue.

Within the basic tonal organisation of *The Dark Rigi*, we can find Goethe's contrasting polarities of blue (mountain) and yellow (sky). They combine, dissolve, gradate and convert into their compounds and other colours to create tertiaries and forms through a Newtonian process of action by light.

In Proposition 2 of *Opticks*, Newton states, "The least part of natural bodies are in some measure transparent and the opacities of these bodies arise from the multitude of reflections caused in their internal parts".

Once the layers of tints have formed the dense material of the Rigi, Turner has rubbed and dissolved top layers of paint film, either with a damp finger or brush, to reveal the internal reflections of iridescent colour trapped in the paper's interstices. This effect is particularly notable in the red apex of the mountain as well as other parts of the Rigi.

Stippled, hatched and drybrushed particles of watercolour reinforce these effects and suffuse the picture. The coloured vapours on the Rigi's summit and base dissolve into blue stipples which scatter like the iron filings Faraday used to depict the lines of force. Similar particles and marks of transparent, semi-transparent and opaque paint diffuse and resonate amid the undulating ripples of the lake.

"Every body it is said emits or reflects numerous inconceivably small particles of matter from each point and plane of its surfaces, continually and in all directions",[73] wrote Turner.

Above the jetty and figures and in many other parts of the picture, opaque "reflexes" and "refractions" of colour oscillate in the viewer's eye. Indeed you can look at these sections in the *Rigi* for ten minutes or longer, unable to define their tone. These shimmering "indefinable tones" which, as Turner recognised, "denies to theory the least indulgence",[74] signify instabilities not only inherent in light and colour phenomena but in our own perception of it. Incorporated in his art, they helped prevent his work from becoming snared by expert or critic alike.

> Newton recognised the phenomenon in Prop. IV and V respectively, stating,
>
> There may be also colours produced by composition which are not fully like any of the colours of homogeneal light [and,] The finely colour'd feathers of some birds, and particularly those of peacocks' tails, do, in the very same part of the feather, appear of several colours in several positions of the eye… as some have observ'd that the colour'd fibres of some silks by varying the position of the eye, do vary their colour.[75]

Whilst Goethe stated in his *Theory of Colours*, "The principles in question have been derived from the constitution of our nature and the constant relations which are found to obtain in chromatic phenomena. In experience we find much that is in conformity with these principles and much that is opposed to them",[76] beside which Turner wrote, "thus all that has been defined come but to this".

How, when faced with nature's complexity and the contrary opinions of experts, do we choose what and what not to collate for our art? As Turner reminded us at the end of Lecture V (1818), "Everyone works in his own way" for the "recipes

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[73] Finley (1973:389). See also Newton's *Opticks* (1979, p1xxi; Qu5, Qu8, p 339).
[74] Gage (1969:111), citing Turner's 1818 RA lecture.
[75] *Opticks* (1979), Theory III.
[76] Gage (TS Vol. 4 No. 2 p50).

for colouring or the quantum of light and shade could but extend into mediocrity and general practice into manner instead of purity of style.[77]

One man's recipe or theory can be another man's prejudice; fashions and interpretations come and go but the practicalities remain. I will in turn outline these practicalities and the tools Turner used which are not available in the mainstream today to enable others to work in their own way.

For Turner, light and colour served as a transmuting medium in which divergent ideas and feelings dissolved and recombined in new and different ways. He could mingle light into his paint through the dense material of lead white, whilst strong gums bound the pigment particles that he drove around to express the idea in mind on tough, handmade, light reflectant papers.

"The imagination dissolves and dissipates in order to recreate, it struggles to idealize and unify. It is essentially vital."[78]

The Dark Rigi, like Mark Rothko's mix of cool and warm colours, draws the observer into an interior illusory space of dreamlike ambiance. It is this which enables us to read what we like into the composition. Whichever interpretations suit our perception, Turner's watercolours work. The chief value of interpretations, and perhaps their only value, is as an aid to our imperfect imaginations; something we can get a grip on.

It is through constant experiment and application with the tools in hand, aided by our imperfect imagination and instincts, that techniques emerge. They in turn help us to try and solve the seemingly insoluble problems nature's phenomena present us with, and to transmit our ideas and feelings in a new or different way.

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[77] Gage (1969:209).
[78] Miller, *Insights of Genius* (1996:381 and 324).

"We can find many similarities between artistic creativity and creative scientific thought, particularly the role of unconscious processing of information."[79]

"At the nascent moment of creativity, boundaries dissolve between disciplines and, as we have found, again and again great scientific discoveries are not made by sweeping deductions but rather by some dazzling new combination of imagery and metaphor."[80]

That we cannot afford to close off avenues which may be fruitful in pushing back the frontiers of innovation in art or science, nor reduce their tools or methods to prescriptive recipes will become even clearer once we have negotiated the labyrinth with Turner in the next chapter.

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[79] Ibid.; see Introduction and below.
[80] Ibid. (p38 and 324).

Chapter IV

Negotiating the Labyrinth

Turner's Philosophy of Practice - Connectors and Conductors, Ideas and Tools

The dazzling complexity of Turner's watercolours such as *The Dark Rigi* or *Norham Castle* (figs. 2 and 13) can be considered labyrinthine and impenetrable, the knowledge they contain remaining distant till their code is cracked.

How Turner came to produce so many innovative watercolours, and at such a prolific rate, is a question few, if any, have addressed. F Barron, in his article "The Disposition Towards Originality", *Creativity* (1978:288), states:

> The psychological conditions which make a society or an epoch creative and consistently original have been little studied but it seems likely that social conditions analogous to those seen in individual creativity are important. Freedom of expression and movement, lack of fear of dissent and contradiction, a willingness to break with custom, a spirit of play as well as of dedication to work, purpose on a grand scale; these are some of the attributes which a creative social entity, whether vast or tiny, can be expected to have.

The lively communication that existed between artists, scientists, poets, engineers, and so on during Turner's lifetime, helped create the atmosphere and innovations the era is famous for.

We know Turner developed an uninhibited freedom of expression in the watercolour medium, made possible by the vast improvements in paper and paint production during the eighteenth and early nineteenth centuries. He had a willingness to break with custom, yet still appreciate and incorporate past ideas in his work, the tension between tradition and revolutionary ideas increasing the propensity for innovation. His dedication to work is unquestionable, evident in the work he bequeathed to the nation - over twenty thousand works on paper and over three hundred oils. As for purpose on a grand scale, romanticism and the sublime were not

just ideas on paper; he lived them out, exploring the limits of his imagination, tools and techniques. His peers had access to the same materials and were concerned with much the same ideas and problems and each had their merits, yet when it came to techniques, it appears Turner pursued and developed them further, with an indefatigable spirit.

His lack of fear of dissent and contradiction caused him to be misunderstood by critics (whose opinions he dismissed anyway) and public alike - though he had his supporters and kindred spirits; many of the more influential artists considered he had taken wrong turnings. The fact is Turner was more likely to get some appreciation from an uninstructed layman than from the would-be man of taste.[1]

Part of the problem lay in the attitude of the classically educated directors who ran the British Institution, men who included Sir George Beaumont, Richard Payne Knight, among others, who preferred to idolise the past masters rather than encourage the efforts of those in the present. As Michael Kitson recognised, they were "no friends of Turner's".[2] When Turner chose to garble his subject and reference in the nonsensical title to his painting *Appullia in Search of Apullus vide Ovid* (1814), he was thumbing his nose at these would-be men of taste.[3]

Though many of their criticisms were directed at his work in oils, watercolour itself was considered by some as not only a poor relation to oils but merely a pastime for genteel amateurs.[4]

Rudyard Kipling's *The Finest Story in the World*[5] satirises a scholar's idolatry

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[1] Lindsay (1966: 130-134).
[2] Hamilton (1997:161, 173); Falk (1938:57). See also Kitson (TS Vol. 2, No. 2 p10).
[3] See Greg Smith, "Watercolour Versus Oil", a symposium abstract (1993) for *The Great Age of British Watercolours 1750-1880*, exhibition at RA.
[4] Also Gage, *Turner* (1996:106-110).
[5] Which Robert Crawford has shown to be a source of TS Eliott's *The Waste Land*; see below.

of the past. The central character, a bank clerk Charlie Mears, recalls a past life as a galley slave to an enthusiastic scholar. He knows at first hand what the scholar or would-be men of taste can only reconstruct, yet the latter dismisses the present day Charlie as an illiterate person. Such people, it appears, must pass into history before they become suitable for intellectual contemplation.[6]

Turner's efforts were not only ridiculed during his own lifetime by connoisseurs, critics and scholars; the abuse continued long after his death.

In Hamerton's opinion (*The Life of JMW Turner*, 1879:146-147 and 368), "The truth is that Turner was one of those persons who seem born to be illiterate. He had not the literary faculty" and "... it is not probable that his opinions had any profoundly philosophical character... From what we know of Turner's intellect, it appears to have been entirely incapable of any sustained critical investigation".

The author WG Rawlinson (*The Watercolours of JMW Turner*, 1904:4) stated,

His lack of education also unfitted him to be the painter of the classical and sacred subjects in which he attempted to compete with the old masters. No doubt there were brilliant exceptions - such, for example, as *Mercury and Herse*, *Ulysses deriding Polyphemus* and others, but I think Ruskin was justified in calling many of them "nonsense pictures".

Whilst Falk, in his biography, *Turner the Painter* (1938:24-25), commented:

His brain could not assimilate the kind of knowledge which one is expected to acquire at school. He saw himself condemned to illiteracy, the inability to put two simple sentences together in the appropriate word - a humiliating fate for one of his lofty ambitions ... His brain was naturally misty.[7]

Turner, like Stephenson or Faraday, may not have possessed the critical approach to knowledge which a conventional university education instils, yet as Gooding (1985:11) noted, "an instilled critical approach can lead to prejudice and so restrict the available options for new approaches to a problem". Those written off as

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[6] John Carey *The Intellectuals and the Masses* (1992:64-66, Faber and Faber).
[7] More recently however Turner scholars such as Lindsay, Gage, Wilton, Hills, Venning, Hamilton and Bailey, among others, have taken a broader outlook to what constituted Turner's education.

uneducated can still think in complex ways whilst getting to grips with the experiences that constitute their reality.

The structure of these experiences or events, and the self-found knowledge they generate, carries a rationale harmonious within itself, a model of the pre-philosophical world.[8]

Expressing opinions along the same lines, the scientist Humphry Davy wrote to his mother in 1802:

> Learning naturally is a true pleasure: how unfortunate then it is that in most schools it is made a pain... After all, the way we are taught Latin and Greek does not much influence the important structure of our minds. I consider it fortunate that I was left much to myself when a child, and put upon no particular plan of study, and that I enjoyed much idleness at Mr Coryton's school. I perhaps owe to these circumstances the little talents that I have, and their peculiar application. What I am I have made myself; I say this without vanity, and in pure simplicity of heart.[9]

Whilst the philosopher Immanuel Kant (1724-1804) was inspired by one school teacher who instilled in him a passion for Latin literature, he recalled that his other colleagues, "were incapable of inflaming the sparks within us for the study of philosophy or mathematics but could certainly blow them out".[10]

Turner was well aware of those who would blow out the sparks of enthusiasm, as we shall see in the following section.

Secure in the knowledge he had found suitable tools to realise his ideas, he set out to gather material for his art. Like the subject of many of his oils, Aeneas, he traced a meandering path, covering as much mental as geographical terrain. Before he had reached his goal of a finished picture, there were still the technical difficulties to

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[8] For more on this subject see Professor Stephen Ceci (Cornell University USA), *On Intelligence - More or Less A Biological Treatise on Intellectual Development* (1996, MIT Press). Miller (1996:330) cites Roger Penrose who in his book *The Emperor's New Mind* claims that there is something in thought which escapes computation.

[9] Knight (1992:14-15).

[10] Christopher Want and Andrzej Klimowski, *Kant for Beginners* (1996:9).

contend with and a choice of two labyrinths to explore.

One, determined by his own interests and which he believed was conducive for creativity, or the other built by the critic, connoisseur and theoreticians which he felt could reduce or inhibit it.

The following will, I believe, help explain how Turner's philosophy or practice enabled him to negotiate these labyrinths in order to produce his innovative watercolours at such a prolific rate.

Together with his lecture notes and some other clues he left, Turner's marginal comments in John Opie's *Lectures on Painting* and Martin Archer Shee's poem *Elements of Art* (both published in 1809) are the nearest we have to his autobiographical writing.[11]

The comments written when Turner was in his early thirties, and often informed by his own experience, provide a graphic insight into his private views on the mental processes involved in painting. They cover the relationship of art and nature, the role of genius and practice, the artist's education and the influence for good or bad of the patron, critic, connoisseur and theoretician.

The central strand or thread which runs through his commentary is Turner's unshakeable belief in genius, particularly his own; as the artist CR Leslie observed, he had an "entire reliance on a guide within himself".[12] Yet Turner did not attempt to define this belief too closely any more than his working processes; since he was of a pragmatic temper, such speculative enquiries had seemingly little practical value.

Perhaps his most explicit statements come on pages 25 and 26 of the poem, triggered by Shee's complaint that an artist left to his own devices was likely to fail:

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[11] For full transcription, see Barry Venning, *Turners Annotated Books*, (TS Vol. 2 No. 1 p36-46; Vol. 2 No. 2 p40-49; Vol. 3 No. 1 p33-44).
[12] CR Leslie's *Autobiographical Recollections* (2 vols., new ed., 1978, Wakefield (i) p112 (cited ibid. TS Vol. 2 No. 1 p36).

"Thus left to roam the graphic wild at will / As chance directs or choice - more fatal still". Turner replies:

> Premissing true talents to exist what danger can arise from chance directing even supposing to be erroneous. Keenness arises with two-fold power and is for ever a beacon and is the strongest precept the artist can receive, 'and can choice be calld fatal still when enthusiastic warmth even love, Nor transient liking take for lasting love' is necessary to accompany him amidst errors to find the track of truth. Must he not find it for himself by his own observation [and] perception, by contrarily combining and rejecting but how can he reject if insensible to error. Can precepts or systematic rules explain them? No. Absurdities they can, but he can avoid not their instruction. No, he will dare to think for himself and in that daring find a method, but if afraid of choosing for himself [he ends by] listening to every pretender who[se] utmost knowledge is a few practical terms or whose great pride is to point out the beauties of his own collection, expecting an humble defference to his opinions lamenting the dullness and apathy of the rising youth or [those who] are incorrigible in not following what knight so condescendingly defined "the direct road to taste". These are the fatall winding[s] the labyrinth or contrarities and fluctuating systems. To have no choice "but that of the Patron" is the very fetters upon Genius that every coxcomb wishes to rivet but Choice
>
> Should I even a beggar stand alone
> This hand is mine and shall remain my own.[13]

Turner continues on the facing page 26 of Shee's poem with an attack on the connoisseur:

> Sir Joshua Reynold's says "one small essay written by a painter is more instructive than a thousand volumes of impossible practice"... but the opinion of a painter is widely different from the opinions of a conisseur. The Painter's ideas of practical knowledge would, if encouraged to give their thoughts, be useful to the student but the conisseuer['s] liberality make[s] him undertake to instruct the Painter the Student and correct the public taste. No, the words of Johnson have encouraged every vain man to set the worst of idols, vanity to [*the* deleted] betray the Student's eager zeal by asserting.
> He that amends the public taste is a benefactor. That there are more amenders than creators and the most find spun syllogisms about shadows of difference and shades of doubt end at last in contrasting improperly the merits and defects of living artists, concerned and anxiously wishing they would Engraft the beauties which they by a refined perception see must be a benefit to the student but
> The Medlar and the Fruit Paradoxes never suit but are always interwoven in Theoretical discussions upon Art and therefore the many volumes that have

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[13] Cited by Venning (TS Vol. 2 No. 2 p43).

> been written become trammels while he who gain'd his knowledge by self-attainment gives and regulates all his opinions by a practical possibility.[14]

What emerges from the above is Turner's belief that the artist should carve out a track of truth through their own observations and perception. Aided by trial and error and daring to think for himself he would develop his own techniques and methods of expression.

If however the young artist allowed himself to be "misled"[15] through the labyrinth of contrarities and fluctuating systems of the patron and connoisseur, whose only "models" were beauties in their own collections, then in Reynolds words he "must be content in always being behind".[16]

It is worth noting that a "Medlar" is a fruit not considered appetising until rotten. Turner had no intention of waiting till he turned into rotten fruit, i.e. passing into history, just to feed the theoretical discussion of the critic or would-be man of taste.

His hands-on contact with his tools ensured any ideas he gained by self attainment, including those gleaned from the study of past masters such as Claude Lorrain, could be tested by their practical possibility in the present.

If the young artist had successfully negotiated the above, there were still the snares of theoretical criticism. On the flyleaves (p3) of Shee's poem, Turner warned:

> [It] teaches to view a production as the result of mere tuition instead of interest [and] is warped from that which can be purchased by a gentle criticism and leads to place a value upon what cannot be purchased. Thus criticism and tuition has produced more Amateurs than Artists.
> However, on flyleaf 4, he writes, "the… pleasure of knowing that you have followd where your interest alone ought to have taught you prudentially to have adhered, will sufficiently provide".

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[14] Venning (TS Vol. 2 No. 2 p42).
[15] Ibid. (p44).
[16] Ibid. and Lindsay (1966 p130).

In his lecture notes he advised his students to look for beauties instead of faults but the artist who criticised without an eye to his own work was no better than the connoisseur:

> Even the uncommendable, the love to discover faults is better far than Theoretical Criticism... [whose]... probe of words may wound but is never [to] reach the heart of practice... but let it always be remembered, he that is such an ingrate, if the Harvest of faults be great... if Harvest it can be called which lowers art instead of raising his profession, it by Practice becomes his own store [which] by his toil he ought to value. By his [relative?] situation in Art he should make use of it, but if he will wound others and if he has no other feeling to attend to be may wound himself.[17]

"Practice is the only means to ascertain the comparative or ultimate value of any theory" including what Turner refers to as "the splendid Theory of Art". For whatever his "instructors load him with they are neither one or the other to him without he proves to himself that they are so" - this serves as a succinct summary of Turner's position on the facing page, 38, of Shee's poem.[18]

A richer harvest than that gathered by fault finding was to be found in the labyrinth of nature's complexity. Here the young artist developed,

> by practice the possibility of attaining what appears mysterious upon principle every look at nature is a refinement upon art, each tree and blade of grass or flower is not to him the individual tree grass or flower but what [it] is in relation to the whole its tone its contrast and its use...[19]

Nature's constantly changing "effects and incidents" defied prescription "for the train of associations in one man's mind may not always correspond to that of another".[20]

The same applied to the perception of colour, for what is dull to one may appear vibrant to another - even the rules of perspective he believed were only a codification of what we learn by experience.[21]

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[17] Cited by Venning (TS Vol. 2 No. 2 p44). (BL Add M46141,S,f35r).
[18] Cited by Venning (TS Vol. 2 No. 1 p40, Vol. 2 No. 2 p41 and Vol. 2 No. 1 p39).
[19] Lindsay (1966:145).
[20] Venning, ibid. (TS Vol. 3 No. 1 p39).

The artist's observations, perceptions and trains of association ran through the mazey labyrinth of the brain's chambers. Here they met feelings, memories and the animal spirits which stalked its corridors.[22]

Summing up near the end of his fifth RA lecture in 1818, Turner stated, "The imagination of the artist dwells enthroned in his own recess [and] must be incomprehensible as from darkness; and even words fall short of illustration or become illusory or pictorial appreciations".[23]

Kant considered the imagination in much the same terms, a place of synthesis whose processes are as "an art concealed in the depths of the human soul, whose real modes of activity nature is hardly likely ever to allow us to discover, and to have open to our gaze".[24]

Kant defined enlightenment as an "exit", a way out of the labyrinth, carved out in part through the refusal to accept prescriptive forms of authority and "having the courage to know your own Reason".[25] This Turner undoubtedly did, whilst holding out that the novice may attain what "appears mysterious upon principle" through practice.

Nevertheless it became a positive feature during Turner's lifetime to invent and investigate imaginary worlds and then invite an audience to view the results whether in the Queen Anne St Gallery, the RA or around the corner at the RI.

> [Turner] did not need to witness the subjects he painted. His greatest paintings are works of imagination than reality. He did not witness *Dido building Carthage*, *Ulysses deriding Polyphemus* or *Hannibal crossing the Alps*"... Indeed, Turner had painted the watercolour *A First Rate taking in Stores* in 1818 for Walter Fawkes in the middle of Yorkshire.[26]

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[21] Ibid. (TS Vol. 2 No. 2 p41-42).
[22] Penelope Reed Doob, *The Idea of the Labyrinth from Classical Antiquity through the Middle Ages* (1990:84, Cornell University Press).
[23] Gage (1969:209).
[24] Want/Klimowski (1996:65).
[25] Ibid. (p151).
[26] Egerton (1995:77).

Ten years earlier, in the same place, he conceived the genesis for *Hannibal* whilst watching a thunderstorm with Fawkes' son. The idea remained on ice for two years. Then, just as Aristotle and Goethe believed colour arose from the interplay of light and darkness, this picture, like many of his other compositions, emerged out of the chaos and flux of marbled paint.

Samuel Coleridge conjured the *Rime of the Ancient Mariner* - he had never been to sea in his life whilst PB Shelley imagined *Prometheus Unbound*; likewise,

> Faraday did not need to understand Andre-Marie Ampère's mathematics, or to accept his molecular currents, in order to proceed in his own way, the way of experiment. Skill was the servant of his imagination and his true genius lay in the ability of noticing some oddity then devising some technique or experiment to test and transmit its significance in relation to the physical world.[27]

John Tyndall believed the imagination, not experiment and observation, to be "the architect of physical theory", citing the work of Newton, Dalton, Davy, Faraday as further examples.[28]

Along the same line, Gjertsen stated, "Newton's success lay in his imaginative integration of many ideas into a single picture"[29] whilst Goethe thought the imagination to be nature's equal.

Turner's philosophy of practice shared many affinities with the above. They were all great connectors, masters in the art of construction working skilfully with their hands, eyes and brains to explore both the physical and invisible worlds.

Coleridge, influenced by Giordano Bruno's (1548-1600) theory of knowledge, succinctly explained the power of the imagination: "It gives birth to a system of symbols harmonious in themselves and consubstantial with the truths of which they

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[27] Here I paraphrase the following: John Meurig Thomas and Brian Pippard, *Michael Faraday and his Contemporaries* (1991:6, National Portrait Gallery Publications).
[28] Smith, *Fact and Feeling* (1994:231).
[29] *Let Newton Be* (1989:23).

are the conductors".[30] The ideas or "symbols" Turner absorbed constellated like a pattern of stars in his mental universe, i.e. the sublime, picturesque, his own observations, what he read, poetry, science and so on. His skill and ability to connect them with his memories, feelings and emotions - all the experiences he felt made life and art worthwhile - evolved into techniques and prevented them from remaining merely abstract and unproductive notions.[31]

Their pattern changed like nature's fleeting moods; what you see in either maze depends on where you stand and what is felt and understand one moment can shift completely in the next. For those lost in the maze of choice, only genius could negotiate these hazards and turn the chaos of information into the clarity of composition[32] but how was this to be achieved?

Facing page 11 of Shee's book, Turner likened genius to a seed that required careful cultivation until it was capable of nourishing itself, for, "Genius may be in each body corporate, yet we cannot look into the seeds of time to know which may blossom or which may fade".[33] The artist's own interests provided the seeds, the atmosphere and the ground from which they could grow, yet they still needed to be nurtured in order to flourish. However Turner acknowledged the problem for the novice or seasoned painter alike was how to "select, combine and concentrate that which is beautiful in nature and admirable in art".[34] Each painter must learn in his own way to distinguish "what is most apt and apposite… from… what is contrarity or would tend to destroy (if represented) the character of that incident.".[35] The novice

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[30] Martin Pollock, ed. *Common Denominators in Art and Science* (1981:60).
[31] Lindsay (1966:131).
[32] Venning (TS Vol. 2 No. 1 p38).
[33] Ibid. (p36), citing lecture note (BL Add MS46151.c.f.4r).
[34] Ibid. (p38).
[35] Ibid.

should aim to "record natures appearances with perfect balance of the various 'departments of painting' - colour chiaroscuro and line".[36]

Mastery of the technical aspects of his art enabled Turner to get to grips with these problems. In broad terms they consisted of the following. His use of distance, middle and foreground as a basic organisational and compositional device for forms.

Economic line drawing, which often incorporated calligraphic loops to group and mass foliage, thereby avoiding getting mired in complex details, could be added during the watercolour process.

As for the age-old problem of producing something original, the process could be instantaneous. New invention could occur in the flicker of a pencil sketch or whilst driving the paint around. An awareness of present time atmosphere, the genius of a place could be expressed through shifting and altering forms, driven by the impression or feeling triggered by a scene or idea. These techniques helped transmute the ordinary and commonplace in a new and different way.

On the other hand, as earlier examples have shown, the process could take weeks, months or even years to evolve, as the parts observed or imagined deposited in the memory slowly accrued and fused into new forms, rather like the forming of a coral reef.

As Turner's youthful mentor, Reynolds had declared in *Discourse II* 11.86-7, "nothing can come of nothing: he who has laid up no material can produce no combinations".

On balance, Turner believed the creative process indefinable, or at least preferred it that way. On page 55 of Opie's book he wrote:

> This inestimable quality is fortunately for the art least subject to rule, or even definition how to be classed; yet we are sensible that it is only attainable by

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[36] Ibid. (TS Vol. 2 No. 2 p41).

ourselves: that our different conception of forms, colour and every occurrence of our lives are by the immediate perception of the intellectual power of the mind, either contrasted or combined or ever ready to combine what is most proper useful and efficient, and to reject what [is] low little or absurd: that to the utmost of our lives this power demands fresh supplies of further knowledge by more observation. But the mind, so far from being clogged in its effects, gathers and combines all the qualities of each idea to be expressed, from the first impression of early youth to mature age.[37]

To remind ourselves, the above was composed when Turner was in his early 30s. The following letter, written in the Atheneum on 29th November 1842 when Turner was 67, reveals with a flourish of exasperation to Dawson Turner how his mind is taken over by new ideas and how he is driven to express them:

> "You ask me 'what are you doing'" – "endeavouring to please myself in my own way if I can for all my determination to be quiet some fresh follery comes across me and I begin what most probably never to be finished".[38]

Once a new experience or some fresh follery entered the chaos of information, coherence could be instantaneous as in the example cited in Chapter II (see f. 30) of Goethe, having many ideas for his novel *Werther* in his head but going nowhere, till he heard the news of his friend Jerusalem's death then, "the whole shot together from all sides, and became a solid mass".[39]

Likewise, the German physicist and colour scientist Hermann von Helmotz (1821-1894) found, "... after the fatigue of the work had passed away, an hour of perfect bodily repose and rest was necessary before the fruitful ideas came. Often they came in the morning upon wakening...". It could take "weeks or months" to yield a solution.[40] He recalled Goethe's words:

What man does not know
Or has not thought of
Wanders in the night
Through the labyrinth of the mind

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[37] Venning (TS Vol. 2 No. 1 p38).
[38] Hamilton (1998:108).
[39] Ronald D Gray, *Goethe the Alchemist* (Chapter 6 "Anatomy, Geology and Meteorology, 1952, CUP).
[40] Miller (1996:355-356).

The dark recess, the incomprehensible inner chamber of desires, dreams, memories and subjective experiences, perhaps the only part of us which cannot be colonised by commerce or critic alike, provided the fresh follery and fantastic surprises in a world of mundaneity. Such states of mind open up boundaries of thought beyond the restrictions imposed by conscious deliberation, commerce or critic. The process can also deal the deadliest blows to bland assumptions of perfect knowledge and maintains art, poetry and science as creative pursuits.

Likewise intuition can serve as a catalyst for thoughts and composition soaring over technical difficulties, selecting and assembling from a mass of information, choices and possibilities to perceive a solution at a glance with a sudden immediate certainty.[41] We will see in the following chapter how this is exemplified by Turner driving watercolour paint around, playing with forms till he decided to stop and let them solidify as in Goethe's example. It is a process that must be felt rather than formulated, what the poet Guillaume Apollonaire (1911) called "the reality of insight".[42]

In sum, the tensions that exist between a disciplined structure and disorder can increase the propensity for innovation. What is crucial is to have something imaginative to structure in the first place, the energy to realise it and the tools to transmit it which Turner undoubtedly did.

Recovering treasures from the imagination and the study of nature was a labyrinthine endeavour in itself. It involved frustration, patience and persistent

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[41] Ibid. (p357-358) notes data selection as a key point in theory construction and cites the mathematician and physicist, Henri Poincaré most critical and far-reaching illuminations occurred in periods that involved unconscious work with no predefined path and/or no set goal. It was this creative mode on which he relied for his research, stating, "It is by logic we prove, it is by intuition we invent" in 1904 and, "Logic therefore remains barren unless fertilized by intuition" in 1908 (ibid. p349-352).
[42] Ibid. (p391). Apollonaire's work relied on conscious ambiguity than unconscious confusion.

endurance requiring "d...d hard work", Turner's only secret he told the young Jane Fawkes.[43]

Through continual experiment, trial and error, techniques evolved which served to shape and transmit his ideas. There were more than enough obstacles to contend with determined by his own interests, without following the fatal windings, contrarities and fluctuating systems of the patron, connoisseur and critic, often with only the beauties of their own collections and prejudices as guides. In their hands the labyrinth served as a metaphor for confusion, error and entrapment.

To become embroiled in their messy disputes and intricate yet fruitless arguments could snare the novice in dark reasonings and system building. The circuitous discourse of their trammels led only to dead ends or out into a desert and both routes could kill the seeds of genius before they had the chance to grow.

Pablo Picasso (1881-1973), famous for his own pictures depicting minotaurs, described his creative process in the early twentieth century in terms similar to those Turner used in the first half of the nineteenth century:

> Research is a waste of time. Painters have got lost trying to explain everything. Pedantry has caused painters to try to paint what they can't see, and what can't be painted.
>
> I'm accused of many terrible things, and the worst is having a theory. You just have to stumble across what you are looking for. [Circa 1907]

Turner, just as Picasso would, learned to conserve his energy for practice.[44] He sought out atmospheres and landscape conducive for creativity where seeds could grow and ideas spark and ignite rather than be blown out.

His tools not only served as conductors and transmitters for his visions, they

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[43] (TS Vol. 5 No. 2 p26).

[44] As Turner, in *Lecture V* (1818), quoting Sir Joshua Reynolds, states, "practice must in some cases precede theory. If not too much time would be lost to obtain that theory, which would arrive too late for practice", cited by Gage (1969:202).

set limits and boundaries to what could and could not be achieved in the medium.[45] Fortunately the handmade papers he selected and the paints he used matched the demands of his imagination.

[45] Faraday and Davy used a whole range of tools and instruments to demonstrate their experiments and investigations into natural phenomena at the RI, such as the rotary motor and the safety lamp. Newton too made many of his own tools, including his famous telescope, stating, "If I'd waited for others to make my tools I'd have waited forever". See S Schaffer, *The Uses of Experiment* (1989:68-99) and *Let Newton Be* (1989:27).

Chapter V

Turner, in his own words, on drawing and painting watercolours

The following collates Turner's own words on picture-making in the watercolour medium. The advice he gave to friends, novices and professionals on the subject was often simple, direct and demonstrative. His preference remained for the simplest of explanations, more hints which allowed the recipient to exercise imagination; too full a discussion on the subject could easily squeeze the life out of a novice's, or indeed a professional's, potential.

What worked for him, he believed could work for others if they were serious about developing their own style.

There were many eyewitnesses who saw Turner at work; some are well known, others are less so; they are here: WL Leitch's (1840s) brief recollections for example provide a nugget of information. Scholarly interpretations of Turner's working methods may not always be in alignment with his own views on the subject, but, taken together with the experiments outlined herein, they will help the reader understand the secrets which lay at the heart of his practice; secrets Turner was either unaware of or preferred to give the impression he was.

When Turner taught, either at the RA or on a one-to-one basis, he told Farington that his preferred practice, "was to make a drawing in the presence of his pupil and leave it for him (or her) to imitate".[1] He would point out a defective part of a drawing, asking, "What's that for?", walk on by, return later and if the student had corrected it by his own device, he would supply another hint; if not, he might remedy the fault himself with pencil or crayon, showing rather than telling someone what to

[1] Bailey (1997:33).

do.[2] For "those things which evidenced thought, personal feeling and the giving out of soul were altogether incommunicable".[3] When one student asked him, "Oh Mr Turner however am I to do this?", "Find out" was the snappy reply.[4]

Neither could mastering perspective – a perennial problem for artists like colour harmony and composition – be solved by following precise mathematical or geometrical rules and ratios. On one occasion the artist G Barret was attempting to draw a temple in a landscape by rule; it prompted Turner to remark, "You will never do it that way".[5] He made his position clear at the end of one lecture when he admitted, "After all I have been saying to you gentlemen – the theories I have explained and the rules I have laid down – you will find no better teachers than your own eyes, if used aright to see things as they are".[6] In other words, if you cannot do it by using your own eyes, instinct, trial and error and hard application, you have got a problem.

The last word on the subject was recalled by the painter David Roberts. His health was proposed at one occasion by an Irishman who had attended the lecture and Turner replied in a jocular way that "he was glad this honourable gentleman had profited so much by his lectures as thoroughly to understand perspective, for it was more than he did".[7]

Turner's drawing practice

During his childhood, he had scribbled and copied images that took his interest. In youth he studied plaster casts and life models at the RA, honed his line

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[2] Ibid. (p153) and Wilton (1987:178); Barnard (1877:179).
[3] Thornbury (1877:277).
[4] Falk (1938:158).
[5] Hamerton (1909:119).
[6] Bailey (1997:153).
[7] Ibid.

drawing skills in architects' offices and began a lifelong preoccupation with filling sketchbooks full of landscapes and imaginative scenes.

Although a watercolour or oil painting can be produced without a preliminary sketch, as a general rule Turner preferred to employ a delicate line drawing as the basic armature for a composition. Experience taught him the best way of learning to draw was simply by attempting to do it but there were still a few short cuts he could pass on to help the novice; for example, he advised, "If when out sketching you felt at a loss you had only to turn around or walk a few paces farther and you had what you wanted before you".[8]

Whilst out sketching, Turner was like a snap-happy tourist - every glance was a glance for study. He would record scenes from a coach window[9] and became skilled in making fast economic choices, indicating landscape tonalities by alternating his pencil line from light to dark.[10]

Throughout his career, Turner carried sketchbooks of various sizes to record his impressions, favouring small books around 4½ x 7½ inches, about the size of a modern paperback which would fit easily into a pocket.

For his Swiss tour (1802), he prepared the leaves of a sketchbook with grey washes of watercolour paint. This not only provided a different tonal ground to work upon but afforded the opportunity to scrape and rub through to the base paper to

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[8] Thornbury (1877:121).
[9] Falk (1938:129).
[10] Cohn (1977:26) states, "Through the nineteenth century the pigment graphite – a peculiarly English speciality, mentioned as early as 1573 – was used just as it came from the mines: 'The best black-lead pencils ... are those made of pure Cumberland lead, cut into strips and enclosed in red cedar'. Graphite's natural origin could be proved by its anisotropic hardness: 'When pure, the lead will be found to cut freely on two opposite sides, and harder on the other two. In using such pencils, the draughtsman can, by turning the pencil as he desires, produce a light or dark line'."
During Turner's era, the pencil was often cylindrical in shape; other devices to replace cedar wood were invented to hold the thin lead in place, such as metal sheaths similar to our clutch pencils. For more on the pencil, see Henry Petroski, *The Pencil: A History of Design and Circumstance* (1989:126-144), Faber and Faber.

create highlights.

However his working preference remained with blank white to off-white, crème paper. Among his drawing tools were black lead graphite pencils, often our B to 2B in range, stale pieces of kneaded bread served as rubbers. Black and white chalks and pens dipped into watercolour provided a different feel and quality of line when the occasion demanded (the late *Swiss series* (1840) (see fig. 131), for example).

Turner's youthful training in architectural drawing – "my real master you know was Tom Malton", he said[11] - taught him how to work fast and effectively, taking advantage of the fact that most architecture is symmetrical. So when sketching, he knew he could draw half of the building, then move on swiftly to the next subject. He saved time by notating colours and atmospheric effects in words rather than try to secure them on the spot with watercolour paint, for nature's phenomena can change twenty times over in just a few minutes. Complex masses of foliage were indicated with calligraphic loop like pencil lines – the details being completed during the watercolour process.

Evidence that Turner worked in this manner can be found in the many annotated sketches he left behind (see fig. 48). In addition the architect John Soane's elder son, who was travelling in Italy in 1819 at the same time as Turner, told his father that,

> "a sucking blade of the brush made the request of going out with pig Turner to colour – he grunted for answer that it would take up too much time to colour in the open air, he could make fifteen or sixteen pencil sketches to one coloured and then grunted his way home".[12]

Pausing for a while, he would consider the most salient and interesting

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[11] Thornbury (1877:27).
[12] Powell (1987:50).

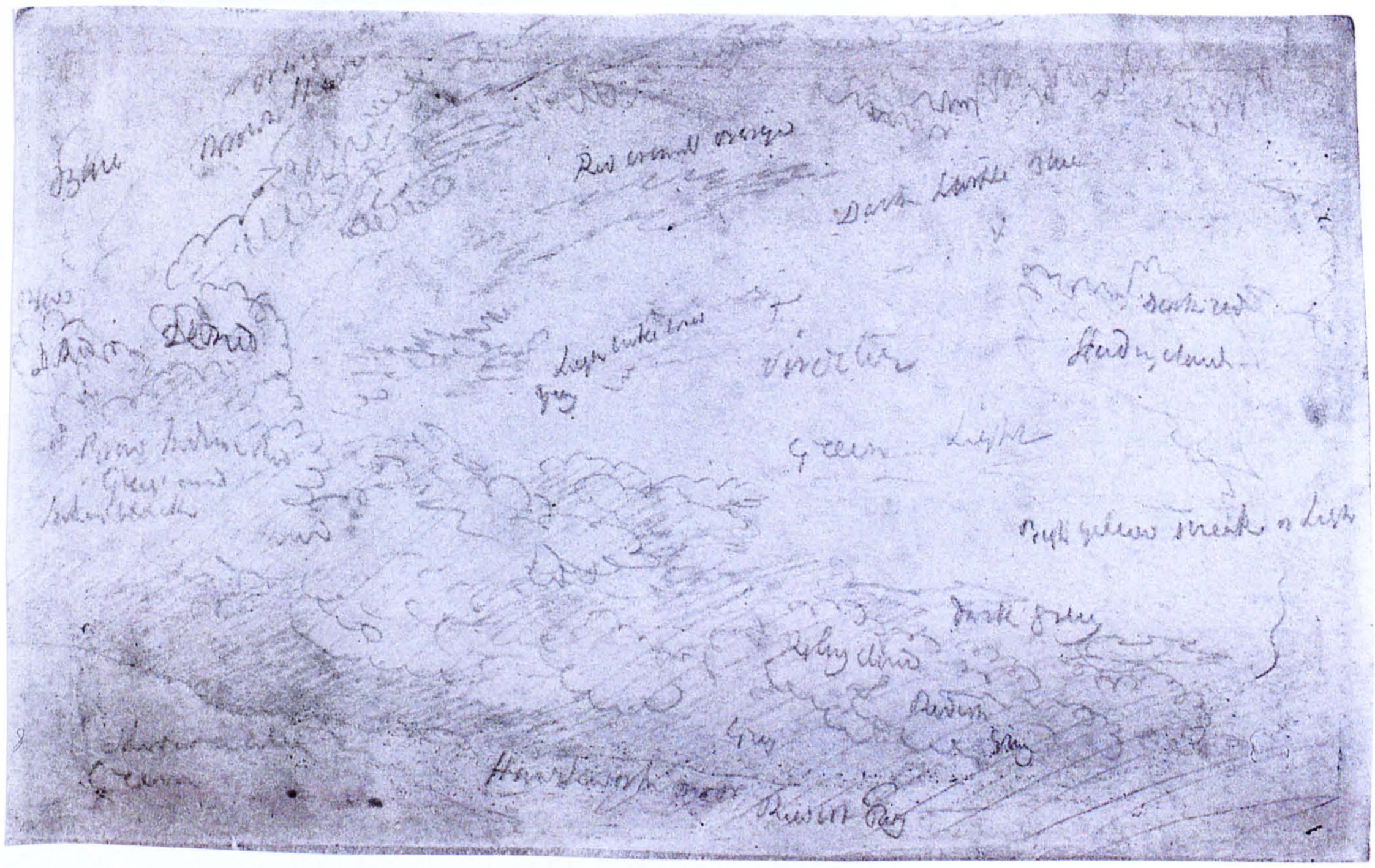

Fig. 48

compositional points of a scene, and which visual information to include or exclude. The chief features which gave character to the scene would be recorded whilst superfluous minor details could be omitted, deemed both unnecessary or impossible to include. Freed from the topographic slavery of his early youth, he would omit the multiplicity of nature's irrelevant facts, altering details and modifying as he drew.[13]

His main concern was to record unchanging essentials rather than the transient and variable – his imagination could operate as nature's equal re inventing or animating effects, details and atmospheres when he produced the watercolour at home or in some inn during the evening perhaps by the steady light of an Argand oil lamp.

The topographical watercolourist and pioneer photographer William Lake Price, writing in the *Photographic News* (1860:407), provides a vivid recollection of Turner's sketching practice during his Swiss tour, possibly Summer 1843:

> Some years since, on the Lake of Como, he happened to be on the same steamer with the great poet of the pencil, TURNER, and thus had an opportunity, of which very few can boast, of seeing him sketching or painting. Turner held in his hand a tiny book, some two or three inches square, in which he continuously and rapidly noted down one after another of the changing combinations of mountain, water, trees &c. which appeared on the passage, until some twenty or more had been stored away in an hour-and-a-half's passage. This example of so consummate an artist shows the engrossing love of the pursuit, with which excellence in it must always be accompanied.[14]

Again during a Swiss tour, Ruskin was informed that:

> Turner used to walk about a town with a roll of thin paper in his pocket and make a few scratches upon a sheet or two of it, which were so much shorthand indication of all he wished to remember. When he got to his inn in the evening, he completed the pencilling rapidly and added as much colour as was needed to record his plan of the picture. (R.XIII, p190)[15]

Sketching could even become secondary or unnecessary when it came to

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[13] Hamerton (1879:65-77) traces the transmogrification of Kilchurn Castle 1802, a place the author had lived near for years.
[14] Wilton (1987:227).
[15] Ibid.

picture making, Turner choosing to trust the transmogrifying power of his memory instead. This approach was strictly for the confident virtuoso rather than the aspiring amateur – a familiarity with the scene also helped.

Frederick Goodall (the son of the engraver Edward Goodall, who engraved the following work) described the genesis of Turner's watercolour *Oxford, From North Hinksey* (circa 1834-1840) (see fig. 49) in his book *Reminiscences* (1902:54-55):

> My father was commissioned by a publisher to engrave a large drawing after Turner of *A Distant View of the City of Oxford*. One of the Dons of a College accompanied Turner to the spot from which they wanted the drawing made. The first day he (Turner) went up he said, "This won't do; I must come up again" but a second visit proved fruitless. When they got up to the hill on the third day, a thunderstorm was coming on, with dark purple clouds over the city, bringing out all the fine buildings into light against it. "This will do", said Turner, "I don't want to make a sketch; I shall remember this". And he certainly knew every building in Oxford, for he had drawn them when he was a boy. But when the plate was being engraved, the publisher asked my father to go down to the spot and look at the view. He took me with him, with my sketch-book to make the drawings of the distant buildings and put them in their proper places, for Turner was a little careless about that. I went down and made the drawings to help my father in his engraving. But, I thought, when I looked at the city, that it was not as beautiful as Turner had made it. The effect was extremely fine with the dark purple clouds above. I had never seen the city of spires and towers under that aspect.[16]

A slight sketch could provide a general idea of a place and gave his imagination a free reign when it came to the watercolour process. Indeed, the forms and actual objects in the real scene were,

> nothing but pawns or counters in the artist's game of pictorial expression and as such the artist has absolute power over them, altering them and annihilating them as best suits his purpose. The artist is also entirely within his rights when he introduces fresh elements from other and different scenes to enforce and make clear his meaning. That Turner used those privileges to the utmost in the case of both these subjects is evident when we compare the sketches with the finished designs.[17]

Just as the earth's topography had been formed by violent processes, molten

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[16] *Turner Studies* (Vol. 1, No. 2, p52).
[17] Finberg (1910:36).

Fig. 49

flux and flood, the driving force behind Turner's pencil and brush could move mountains and valleys as he saw fit to make them artistically manageable. For if the location of a place can change over time, why cannot the artist speed up or slow down this process within the spontaneous flicker of a pencil sketch. The fact is, Turner rarely drew a place as it really was – he often altered mountains and valleys by a sublime factor of two-thirds to achieve effects of grandeur and to express more forcibly ideas of height, depth and distance.

Turner's watercolour practice, his own words, eyewitness and scholarly accounts

Turner revealed much in the way of advice to friends and enquirers about his watercolour practice and where words are scant there is visual evidence - the preliminary drafts, sketches and finished essays he produced in the medium. Here I will begin by outlining the skills he honed during his youth, namely the laying in of flat gradated tints to build an image tonally, before moving onto his more complex techniques and methods of mark-making which include the sculpting and modelling of wet paint and his high degree of finishing or stipple and hatching.

We will see how his skill and imagination matched with the tools he used enabled him to follow through a complex range of techniques in a prolific fashion.

It is true that Turner "learnt the value of gradation from the habit of using only one colour"[18] when tinting architects' drawings and laying in skies at Malton's and Hardwick's during his youth. Colouring Boswell's seventy plates of *Picturesque Views and Antiquities in England and Wales* for Mr Lees in 1786 provided an even earlier grounding in the technique.

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[18] Thornbury (1877:38).

When he was seventeen, he singled out one work for special attention – the watercolour *Battle Abbey* (figs. 50 and 51) which the artist Michael "Angelo" Rooker (1746-1801) exhibited at the RA in 1792. Turner made two watercolour studies of the picture in order to find out how Rooker had achieved his effects using multiple layers and tints of paint[19] (see fig. 52). By 1794 whilst working part-time in Monro's studio and attending the RA he was producing works of equal stature such as *St Anselm's Chapel, with Part of Thomas-a-Becket's Crown, Canterbury Cathedral* (fig. 53).

Turner also absorbed the topographic style and techniques of Edward Dayes[20] and Thomas Hearne, among others. Their works, which he had seen in Monro's studio as well as private collections, also depended on a scale of modulated tonal tints. It was at Monro's too that he copied the more imaginative works of JR Cozens (see figs. 54 and 55). Cozens' watercolours also contained fine examples of gradated tones and aerial effects, and the comment, "You always feel you can breathe in one of Cozens' landscapes"[21] would become synonymous with Turner's own work.

However, Turner would go a league further than all the above artists, eventually widening the tonal scale to its limits and evolving new modes of technical expression in the medium. As Wilton (1975:12) recognised,

> Turner's watercolours defy an exact analysis into areas of wash and areas of precise touches. The whole surface is an involved mixture of the two contrasting methods. Turner takes them both to much greater extremes than JR Cozens, being far looser on the one hand and far tighter on the other.
>
> This will become clearer in turn.

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[19] See also Eric Shanes, *Turner and the Scale Practice in British Watercolour Art* (November 1997:45-51, Apollo) and *Turner's Watercolour Explorations* (1997).
[20] Turner possessed Dayes' book *The Works* (1805) which included instructions for drawing and colouring landscapes with much discussion of Claude Lorrain's practice. Dayes is on record stating that Turner was "unteachable" and he became jealous of another student, Thomas Girtin, who soon surpassed his tutor.
[21] Thornbury (1877:64).

Fig. 50

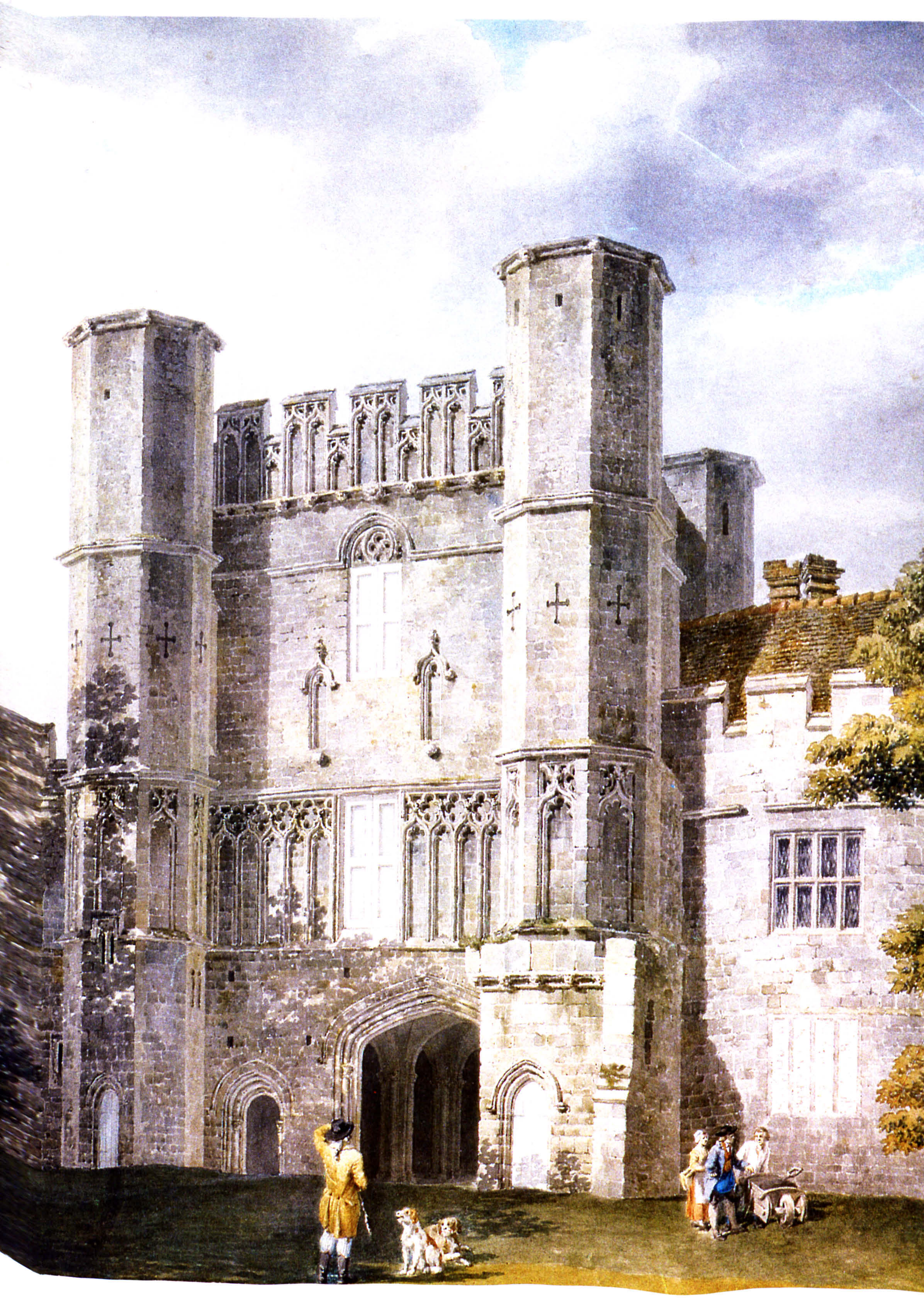

Fig. 51

Fig. 52

Fig. 53

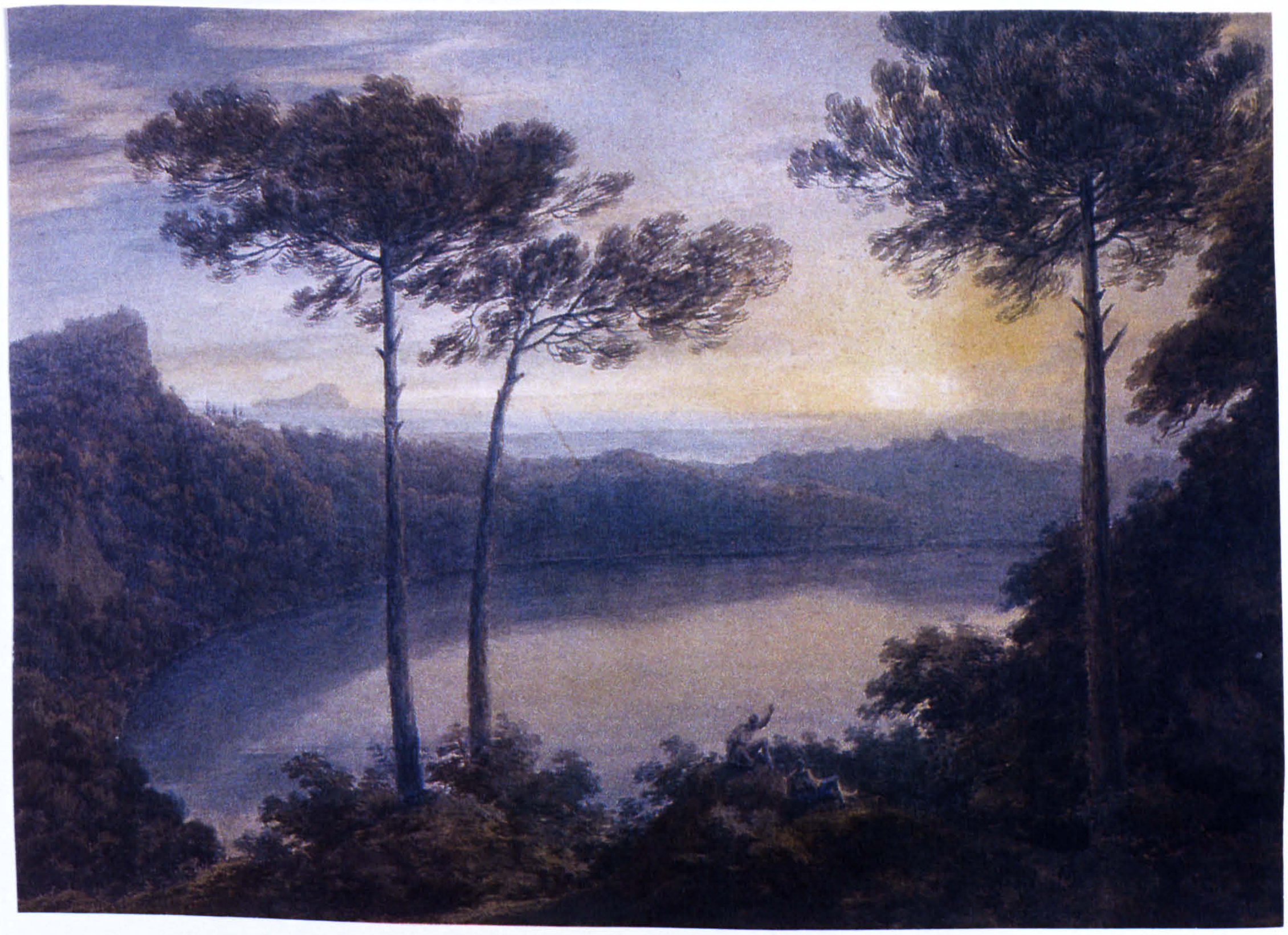

Fig. 54

Fig. 55

Flat gradated tints of watercolour built up tonally within a precisely delineated drawing provided an effective way of producing works such as *Anselm's Chapel* (fig. 53) where, "the local colour was laid on at once in its proper spot, and shadowed and tinted with gradated tones varied by reflections".[22] But a crucial fact of Turner's innovation in the medium was to incorporate the lessons learnt from the above tonal scale practice and blend them, almost indistinguishably, with a more energetic and expressive mode of working. This consisted of sculpting and modelling wet paint with his brush – or sometimes a finger or piece of rag – whilst the paper was wet or dry and exploiting all the benefits of gradation.

The genesis of the technique may have taken place at Monro's studio during the early 1790s where both he and his friend Girtin played around with watercolour paint in an uninhibited fashion. The young artist William Havell noted that both were,

> …great experimentalists in rendering paper with water-colours subservient to the expression of light, which they found to be chiefly dependent on gradation . . . In such matters, there was no trick they were not up to. Turner used to cut out figures in paper and paste them on his drawing. If his experiments spoiled one part of a drawing, he would paste the good part upon another piece of paper, rub down the edges of it, and work on the new surface till he brought the whole into harmony. He and Girtin would also seek to create gradation by pumping water upon their drawings.
>
> Girtin is thought to have discovered how to 'wipe out lights' in a watercolour when he accidentally spilled water on a drawing and then sopped it up with a handkerchief. The places where the water had lain were left white, the colours removed.[23]
>
> Turner worked out how to do the same thing using pieces of bread as mops. He damped, soaked and pumped water onto his paper to assist gradation of tone.[24]

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[22] Wyllie (1905:24), quoting Thornbury.
[23] Bailey (1997:33).
[24] Falk (1938:162) states, "a neighbour whose garden commanded the back of Turner's premises in Queen Anne Street, saw him energetically using the pump on a group of his latest masterpieces," some years later. See also Wyllie, ibid. (p23).

Repeated washings and tints of colour enabled him to obtain the textural effects of opaque material such as stone, masonry and terrain. Repeated soakings with water enabled him to penetrate his opaque subjects with light as well as create vaporous and dissolving distances.

We will now look at the above techniques in detail.

Firstly before starting the watercolour painting, the paper to be worked on must be stretched to prevent it from creasing and cockling once the paint hits the paper.

Though it is not certain which method of stretching paper Turner preferred, any of the following will do the job.

The paper is placed into a dish of water for between 30 seconds to two minutes. Then it is lifted out by the edge, the surplus water allowed to drain off, and placed onto a smooth wooden panel or board. A modern method favoured by some conservationists is to use a small garden spray to apply a fine mist of water to the back of the paper rather than soaking it thoroughly. The paper is attached to the wooden panel either by using glue around its edges or the more common method – gum-strip tape, such as parcels are still bound with.

Once dry, a fine preliminary drawing can be placed on the paper to mark out the salient points as a structural guide to the composition. The pencil line, if too heavy, may be reduced in tone by lightly erasing it with a bread ball rubber. In many of Turner's unfinished watercolours, such preliminary drawings can still be seen (see fig. 56).

Sometimes Turner would skip the pencilling stage altogether and proceed with the watercolour till the image was concluded; on other occasions he would draw a faint sketch on top of papers he had tinted (see fig. 57).

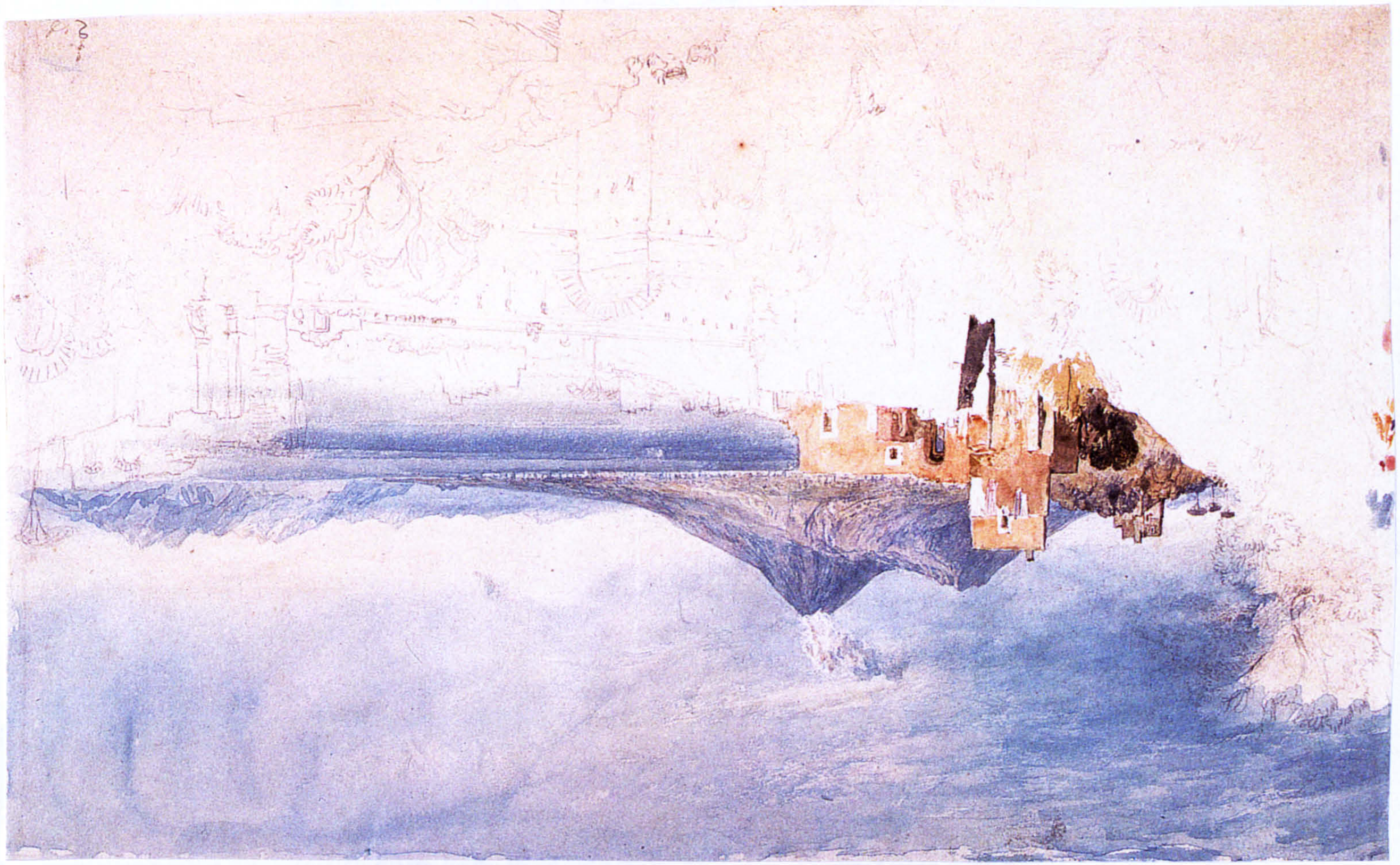

Fig. 56

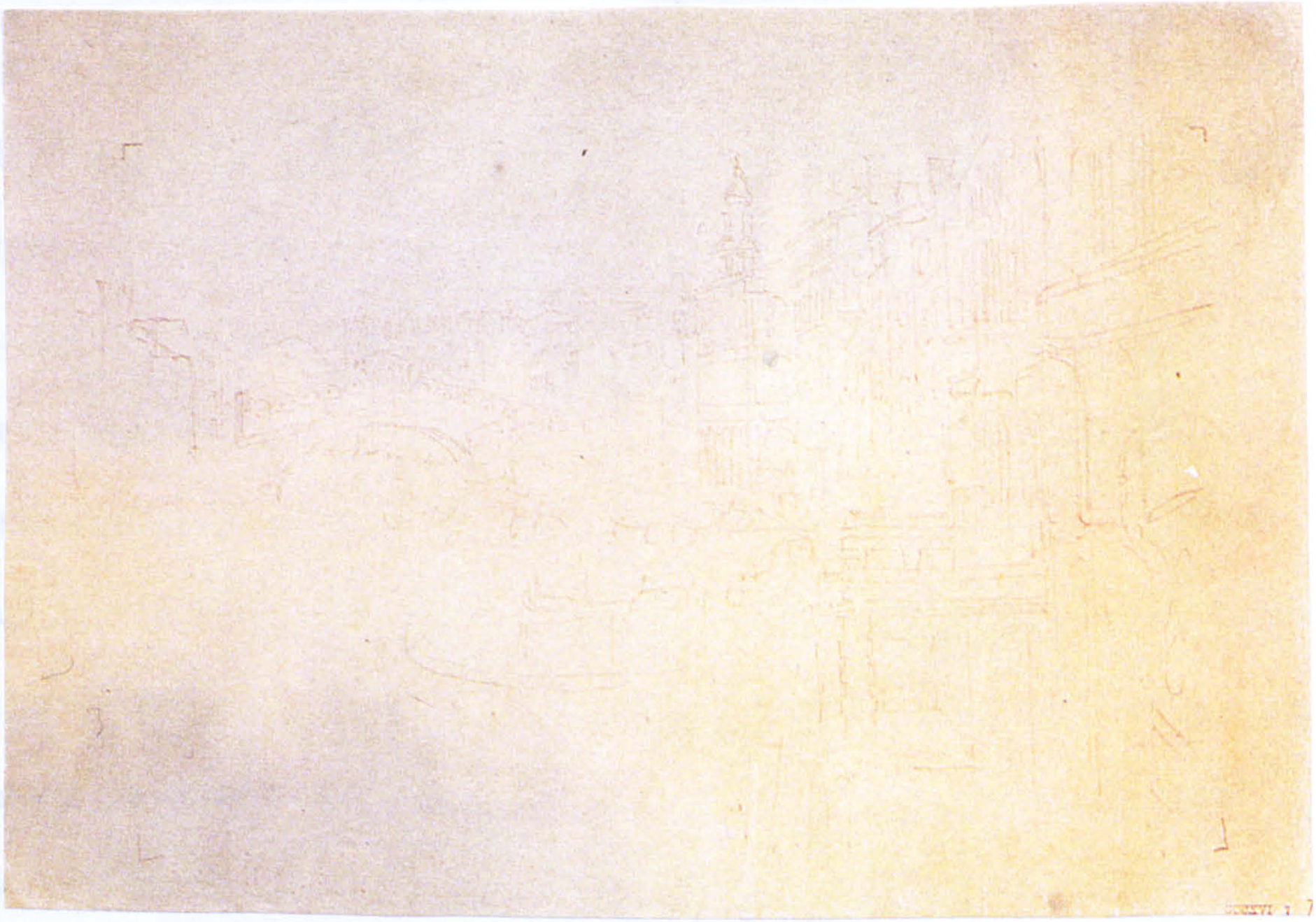

Fig. 57

Building an image tonally, the gradation of watercolour tints

> Give me some mud off a city crossing, some ochre out of a gravel pit, a little whitening, and some coal dust, and I will paint you 'a luminous picture', if you give me time to gradate my mud, and subdue my dust: but though you had the red of the ruby, the blue of the gentian, snow for the light, and amber for the gold, you cannot paint a luminous picture, if you keep the masses of those colours unbroken in purity, and varying in depth. (John Ruskin *Elements of Drawing* 1971:149, Dover reprint.)

The following explains how Turner achieved the above effects.

The board, with the paper stretched on it, may be tilted to a suitable angle, 30 degrees, or thereabouts, by resting it on a sloping surface such as a desk or a small pile of books. This gentle slope prevents the paint from gathering in one area, as movement of the paint is essential for this technique. To paint a gradated blue sky, for example, the brush is dipped into the colour mixed with water and, taking as much of the liquid as it will carry, the artist begins at the top of the paper, laying a pond or runlet of colour along the top edge, moving from left to right. This pond of colour is led gradually downwards towards the horizon, not faster at one place than another, but as if the artist were adding a row of bricks to a building all along (only building down instead of up), dipping the brush in water to gradually dilute the paint, each time rejoining the tidemark of the tint to ensure a seamless joint. Thus, the top part of the sky will be darker and purer while the rest of the tint will gradually pale and disperse towards the horizon to create an effect of distance. A morning sky, for example, may be achieved by laying down a pale wash of lemon yellow and a subsequent tint of cobalt or Prussian blue, fortified with white bodycolour if need be, is laid on top in the above manner once the first wash has dried.[25]

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[25] Cohn (1977:37) states, "Advocates of pure wash urged self discipline on their pupils for such transparent overlays require that the first layer be virtually dry before reworking. 'Be patient and let your first tint dry before you touch it again … you only flurry yourself by dashing at nothing.'" Thomas Hatton, *Hints for Sketching in Watercolours from Nature* (2nd edition, 1853:38, London) and ibid. (p30): Camille Pissarro's technical advice to his son, "you won't dirty the tone if you don't press too much on your brush … work with the point", can be seen in Turner's delicate gradations.

If the tone is deemed too deep, it may be lightened with a damp sponge or water brushed or pumped onto the surface, methods whereby Turner achieve vapour-like, translucent, dissolving distances.

To carry out the above and following techniques, it is essential that the surface of the paper employed is evenly formed. This ensures a smooth flow of paint to create an even tint. If the paper is badly formed and poorly sized, i.e. it has an irregular surface and is absorbent, the movement and flow of the paint will be impaired. This will produce uneven tints and dull areas where the paint has sunk into the paper.

In addition, the paper can be re-dampened slightly by brushing a thin coat of water over it or dipping the board into a basin of water. This enabled Turner to let some washes gradate themselves as they dispersed on slightly damp paper. Subtle edges to forms could also be achieved in this manner and lights picked out with the point of a brush whilst the colour was still wet.

Once the lightest overall wash has been applied, gradated and fashioned as the artist sees fit, subsequent tones may be added one by one to different locations on the sheet. The colour mixed in separate saucers, for example, red: madder, chrome or vermilion; yellow: ochre, chrome or gamboge; blue: Prussian, ultramarine or cobalt, are mixed as need be. Each time the paint is applied to the paper, it is darkened by adding more colour from the watercolour cake. By degrees the image comes together as the work advances from the light distance through the middle section into the dark areas of the foreground. The progression is akin to a theatrical stage set or classical composition by Claude Lorrain.

As the image progressed, Turner often brought the undertints into play as much as possible to create a complex tonal range of secondary and tertiary colours.

A thin glaze of red over lemon yellow to produce an area of orange sky, a cobalt film over mars red to create a purple shadow carving up the landscape, a coat of Prussian blue over yellow ochre to form fields and foliage.

Tertiaries such as russet (orange mixed with purple), evident in autumnal foliage and the endless varieties of greys in the sky, citrine (orange mixed with green), another predominantly autumnal and landscape colour, and olive (green mixed with purple), found within the gloomy greys and darks of foliage, figure strongly in many of Turner's sublime and picturesque watercolours painted between 1790 and 1810. He continued to combine them with a more prismatic palette, centring around the three primaries of red, yellow and blue as his technical arsenal developed. The addition of white bodycolour (lead white, zinc or barium) to the above tints, added as and when he saw fit, created an immense tonal range at the artist's disposal.

The laying of successive tints also provided the opportunity for cutback, a favourite technique of Turner's, whereby he would cut through a top tint with the point of a clean, damp brush to reach the undercoat (eg lemon yellow beneath a cobalt ultramarine sky). This is how he achieved natural effects such as mackerel and cumulus clouds and waves, helped by pushing the paint to a dark edge to create the lines of contrast found in such phenomena.

Indeed colour in nature and her phenomena, on close inspection, will be seen to possess varying degrees of gradated tones. Within a blue sky, for example, one spot will be darker, purer and more intense a blue than anywhere else. It is not necessarily the lightest or darkest part of the sky which will appear the purest in colour; often the two tones gradate, blend or rather fade into each other. Therefore a pure blue may fade into a less pure blue, a greyish, greenish or purplish blue as it gradates towards

the horizon or sunlight. The same applies to distant hills, fields, foliage, masonry and so on.

It was through the careful manipulation of gradated colour, broken in purity and varying in depth, that Turner achieved his luminous effects, without necessarily having to use bright colours at all.

It may take five, fifteen or fifty tinted tones to create the desired effect and it is by the above methods that works such as *Anslem's Chapel* 1794 (fig. 53) were constructed. These techniques, bound up with the tools he used, facilitated speed of execution and enabled him to paint at "a prodigiously rapid rate".[26] More often, Turner did not sit around waiting for a tint to dry but made the most of his time by having a number of watercolours on the go simultaneously.

Eric Shanes in the exhibition catalogue *JMW Turner: The Foundations of Genius*[27] provides a description of Turner's working methods in watercolour including an invaluable reminder of how the papers he used influenced his practice (taken from John Kay's *Paper in History* (1893, London)). He states,

> Turner, when painting in watercolours, generally had several drawings laid down on the same board, which he worked upon one after the other. A great deal of his wonderful charm was produced by constantly washing his work and so getting that extraordinary softness and appearance of distance and atmosphere and only washing frequently would give him this result. He used to work away on one drawing and then wash it partly out, then turn the board round and go on with the next, and so on, and if he had four drawings on his board, by the time he had worked on and washed his fourth picture, number one would be dry and ready to be worked upon again. But if it had not been for the paper being so tough as to stand all this knocking about, without becoming pulpy or buckling, he would not have been able to have given us the many beautiful pictures he has.

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[26] Eric Shanes, *Turner and the Scale Practice in British Watercolour Art* (November 1997:48 p45-51, Apollo).
[27] "JMW Turner: The Foundations of Genius" (19 September – 2 November 1986 p16-17, Taft Museum, Cincinnati, Ohio) reviewed *Turner Studies* (Vol. 6 No. 2 p64-65).

By 1799 Turner had produced about three hundred watercolours and exhibited eleven oil paintings.[28] The watercolours of his early youth were competent enough but his style had been criticised around 1798 by Farington and other academicians, including John Hoppner, as being too "mannered", i.e. stilted and devoid of feeling.[29] Their opinions, like their own artistic efforts, would soon be eclipsed by Turner's innovations.

All the while, he had been emulating and absorbing the methods of a whole range of past and present masters. By the end of the next decade, he had gained an intimate familiarity with the techniques of Richard Wilson, the Dutch marine painters, van de Velde and Aelbert Cuyp, Rembrandt, Rubens, Titian, Poussin and his favourite, Claude Lorrain, among many others. In addition he continued to trawl the landscape for fresh stimuli and found his own brand of Claudian vistas in Northumbria, Yorkshire, Sussex and around the Thames. In 1802 he would begin the first of many foreign tours, on this occasion visiting Switzerland via France.

There were and still are methods for the shaking off of stereotypes and attaining fresh vision. The following were common currency during Turner's era, discussed no doubt in the RA or Monro's studio. However not many chose to absorb them and move on to evolve their own techniques with the same instinctive and imaginative ingenuity as Turner. The aim to free ideas from any control by reason in order to facilitate invention could be traced to Leonardo Da Vinci[30] and even

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[28] Hamilton (1997:56).
[29] Finberg (1961:61).
[30] Wilton/Lyles (1993:30) and Lindsay (1967:83).

beyond.[31] His famous observations concerned the suggestive properties of "an old wall covered with dirt" or "the odd appearance of some streaked stones where you can decipher "several things like landscapes, battles, clouds, uncommon attitudes, humorous faces, draperies and so on. Out of this confused mass of objects, the mind will be furnished with an abundance of designs and subjects perfectly new".[32]

In 1785, Alexander Cozens cited the above authority to reinforce his own technique of using blots of ink and paint to facilitate invention in his book, *A New Method of Assisting the Invention in Drawing Original Compositions of Landscapes* (1785). His ideas were put to practice with great effect by his son JR whose work Turner admired and emulated at Monro's. Lindsay states, "Turner seems certainly to have owned one of the four versions known of the thirteenth *Blot in A New Method*".[33] So what precisely constituted a *blot*? (See fig. 58.)

> A true blot is an assemblage of dark shapes or masses made with ink upon a piece of paper, and like-wise of light ones produced by the paper being left blank. All the shapes are rude and unmeaning, as they are formed but with the swiftest hand. But at the same time there appears a general disposition of these masses, producing one comprehensive form, which may be conceived and purposely intended before the blot is begun. This general form will exhibit some kind of subject, and this is all that should be done designedly.[34]

Just as Poussin used small wax models and mannequins arranged and draped within small dioramas, and Claude moved his mythological and mortal characters in compositions resembling stage sets, Thomas Gainsborough (1727-1788) created imaginary landscapes with broccoli, bits of earth moss and glass in a miniature theatre at home in order to trigger his own designs.[35] He also incorporated the idea of

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[31] The cave painters of Lascaux employed similar techniques, prompting Picasso to comment, "I have invented nothing", or words to that effect. In the 1920s and 1930s, the surrealists developed a whole range of techniques along the same lines, including Decalomania. This involved sandwiching mixtures of wet paint between sheets of paper, canvas and so on, then prising it open to reveal startling patterns the artist – such as Max Ernst – could build upon.
[32] Lindsay (1967:83) and Wilton/Lyles, ibid.
[33] Lindsay (1967:83).
[34] Ibid.
[35] Wilton/Lyles (1993:38).

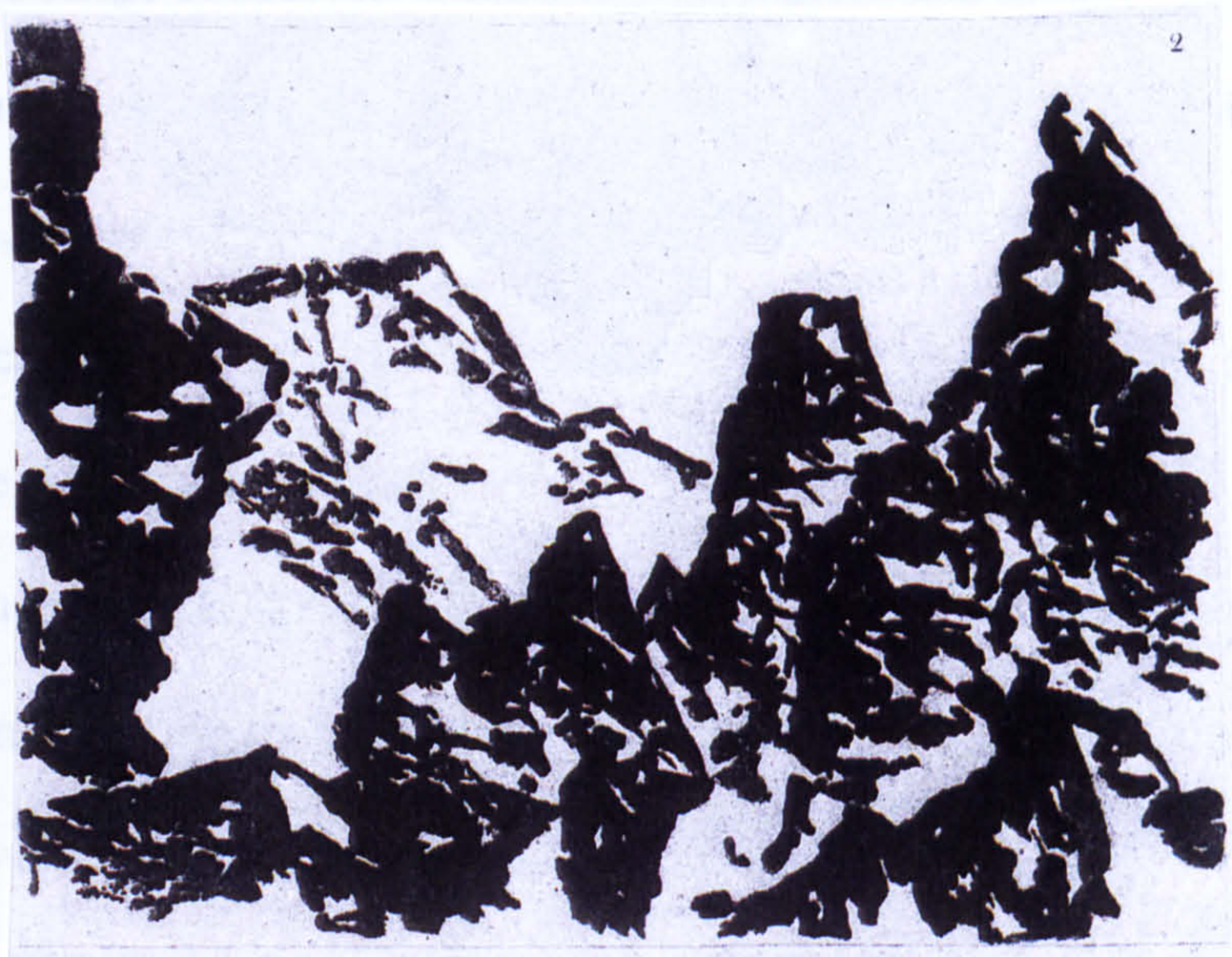

Fig. 58

Cozens' blot and Da Vinci's stain techniques in his *moppings* of colour which, we shall see, resonates with some of Turner's own methods of picture making.

Reynolds summed up Gainsborough's techniques in his Discourse XIV:

> It is certain that all those odd scratches and marks which, on a close examination, are so observable in Gainsborough's pictures, and which even to experienced painters appear rather the effect of accident than design; this chaos, this uncouth and shapeless appearance, by a kind of magick, at a certain distance assumes form, and all the parts seem to drop into their proper places; so that we can hardly refuse acknowledging the full effect of diligence, under the appearance of chance and hasting negligence.[36]

Turner would have become familiar with Gainsborough's works and techniques from a range of sources. Monro was a collector and imitator of his work; Hoppner too, whilst one of his closest artist friends whom he had known since his teens; WF Wells, was an authority on the painter.[37]

How much the above ideas influenced Turner's watercolour practice may be inferred from the following.

Farington recorded on 21 July 1799 that Turner called on him during the morning. The same day, Hoppner held a tea party in the garden of his Fulham home, attended by fellow artists and academicians Opie, Fuseli and Sawrey Gilpin. Turner joined them later and during his conversation with Farington, he gave a hint about how he produced his watercolours: "He told me he has no systematic process for making drawings. He avoids any particular mode that he may not fall into manner. By washing and occasionally rubbing out, he at last expresses in some degree the idea in his mind ..."[38]

Turner called on Farington again a few months later, on 16 November 1799

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[36] Gage (1987:116 and 115); The Rev. Henry Scott Trimmer, another of Turner's close friends, inherited a collection of his work, whilst Gainsborough's niece, Sophia Lane, another friend, kept a number of his figure drawings.
[37] TS Vol. 4 No. 2 p22.
[38] Finberg (1961:61).

and, still pursuing the same method,

> He reprobated the mechanically systematic process of drawing practised by Smith [John Smith, known as 'Warwick Smith'] and from him so generally diffused. He thinks it can produce nothing but manner and sameness. The practice of [here a blank is discreetly left] is still more vicious. Turner has no settled process but drives the colours about till he has expressed the idea in his mind.[39]

Just over four years later, 28 March 1804, Farington's diary recorded in detail techniques which Turner had employed in the medium since the late 1790s and would continue to do so for the rest of his career. In addition, as Wilton (1975:9) noted, the diarist was well aware that such techniques were attracting the attention of other watercolourists:

> The lights are made out by drawing a pencil (old term for a brush) with water in it over the parts intended to be light (a general ground of dark colour having been laid where required) and raising the colour so damped by the pencil by means of blotting paper; after which with crumbs of bread the parts are cleared. Such colour as may afterwards be necessary may be passed over the different parts. A white chalk pencil (Gibraltar rock pencil) to sketch the forms that are to be light. A rich draggy appearance may be obtained by passing a camel hair pencil nearly dry over them, which only flirts the damp on the part so touched and by blotting paper the lights are shown partially.

In the autumn of 1800, when Turner was staying with WF Wells at his home in Knockholt, Kent, Joshua Cristall, the painter, also a guest, witnessed the following incident and relayed it to his friend, the artist Samuel Palmer:

> Turner had brought a drawing with him of which the distance was already carefully outlined, but there was no material for the nearer parts. One morning, when about to proceed with this drawing, he called in the children as collaborateurs for the rest, in the following manner. He rubbed three cakes of water-colour red, blue and yellow, in three separate saucers, gave one to each child, and told the children to dabble in the saucers and then play together with their coloured fingers on his paper. Turner watched the work of the thirty little fingers with serious attention, and after the dabbling had gone on for some time, suddenly called out, "Stop!". He then took the drawing into his own hands, added imaginary landscape forms, suggested by the accidental colouring, and the work was finished.[40]

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[39] Finberg (1961:63).
[40] Hamerton (1879:190).

It is clear from the above that Turner was prepared to play around like a child with his paint and paper in order to maintain an emphasis of surprise in his art. His tolerance of ambiguity and a willingness to accept uncertainty as a part of his practice became a strength not a weakness. "I never lose an accident", and, "Always take advantage of an accident", he told the young critic and his would-be champion, John Ruskin[41] – accidents that could be developed into a cloud, a mountain or any strange phenomena. Such an emotional and fluid handling of paint still benefited from having the goal of a composition in mind. This may be suggested by a precise drawing, a light sketch or a private vision, a choice determined by how he felt or the occasion demanded. It was and still is a delicate balance between precision and chance which Turner carried off through placing an emphasis on one, none, or the other, as he saw fit. Combined, they produced a compelling creative tension in the finished work.

However in 1803, after the annual RA dinner, Hoppner, who had said only five years before that Turner was "a timid man afraid to venture", now "reprobated the presumptive manner in which he paints and his carelessness. He said that so much was left to be imagined that it was like looking into a coal fire or upon an Old Wall, where from many varying and undefined forms the fancy was to be employed in conceiving things".[42]

The watercolourist Samuel Palmer, recipient of the Knockholt story, provided another interpretation:

> The first exhibition I saw [in 1819] is fixed in my memory by the first Turner, *The Orange Merchantman at the Bar*; and, being by nature a lover of smudginess, I have revelled in him from that day to this. May not half the Art be learned from the gradations in coffee grounds?[43]

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[41] Hamilton (1997:264) and Lindsay (1967:84).

[42] Finberg (1961:99). Such criticism continued throughout his career. Mr Lenox, who bought the oil painting *Staffa* (1832) complained that he thought the work indistinct – Turner replied through his intermediary, "You should tell Mr Lenox that indistinctness is my forte" – it was a fault Lenox grew to admire. (Wilton 1987:196)

[43] Lindsay (1967:84).

In the same vein, the poet and painter William Blake (1757-1827), anticipating many a surrealist, said, "I can look at a knot in a piece of wood till I am frightened of it".[44] Samuel Taylor Coleridge's poem *Daydream* dealt with images that came from shadows dancing on a wall.[45] Likewise the young inventor and engineer George Stephenson (1782-1848) would allow his mind to wander in the dancing flames of a coal fire as he searched for solutions to complex problems.[46] His ideas were born in flames and forged in steel whilst Turner's evolved from marbled patterns of paint glistening on the paper.

When Hoppner complained that looking at Turner's pictures was "like looking into a coal fire", he was obviously missing the point. Turner, though an intense practitioner, like many innovators, had a spontaneous, almost nonchalant approach to creativity. He kept an open mind for new ideas and how their possible combinations could grow. In fact it was his belief that a picture could be painted anywhere, as the following incident recalled by Reverend Trimmer's son (circa 1810?), confirms:

> The garden, which ran down to the river, terminated in a summer-house; and here, out in the open air, were painted some of his best pictures. It was there that my father, who then resided at Kew, became first acquainted with him; and expressing his surprise that Turner could paint under such circumstances, he remarked that lights and room were absurdities, and that a picture could be painted anywhere. His eyes were remarkably strong. He would throw down his water-colour drawings on the floor of the summer-house, requesting my father not to touch them, as he could see them there, and they would be drying at the same time.[47]
>
> Sometimes he would tint papers with even tones of colour to provide an undercoat to work upon and an ambience to a finished work. The daughters of his good friend, Walter Fawkes recalled to the painter WL Leitch (1804-1883) how they

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[44] Ibid. (p83).
[45] Ibid.
[46] John F Layson, *George Stephenson* (1881:27-28, London) and Samuel Smiles, *The Lives of George and Robert Stephenson* (1975:33-63 especially, The Folio Society).
[47] Monkhouse (1879:86).

caught a glimpse of this technique at Farnley Hall: "When Turner's bedroom door was open, they saw cords spread across the room as in that of a washerwoman, and papers tinted with pink and blue, and yellow hanging on them to dry".[48]

To test ideas and structures for a composition he would often play around with loose washes of watercolour paint, allowing them to blend and gradate of their own accord. The powers of suggestion in these colour beginnings could trigger pools of memories and past impressions of scenes witnessed or imagined. The time lapse between a pencil or coloured sketch and the finished watercolour could be anything between a matter of hours, days, months or even ten or twenty years, as the following confirm. David Hill, in his book *Turner in the Alps*[49] describes the genesis of the watercolour *Grenoble* (circa 1824-1825) (see figs. 59 and 60):

> He thought about the latter for more than twenty years before finally carrying it into effect, and the result is one of his most mature conception. He worked out his ideas in three rough colour sketches before he was finally satisfied that he could begin. These 'roughs' are usually known as 'colour-beginnings' and he frequently used them as a means of working out the colour structures of his compositions and of collecting his thoughts about the subject. They served as pools of memory in which his ideas and recollections could crystallize.
>
> His sketches of Florence in the winter of 1819 were realised in watercolour

some eight years later as a city basking in sunshine (see figs. 7 and 8).

Ruskin's summary of Turner's watercolour *The Battle of Fort Rock, Val d'Aosta* (1796) (fig. 61) - produced from material gathered during his Swiss tour 1802 but painted in 1815 – includes several references to his sculpting and modelling wet paint:

> There are lights bluntly wiped out of the local colour of the sky and sharply and decisively on the foreground trees; others scraped out with a blunt instrument while the colour was wet, as in the moss on the wall, and part of the fir trees on the right-hand bank; lights scratched out, as in one of the water-

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[48] TS Vol. 5 No. 2. p26.
[49] David Hill, *Turner in the Alps: The Journey through France and Switzerland in 1802* (1992:32, George Philip pub.).

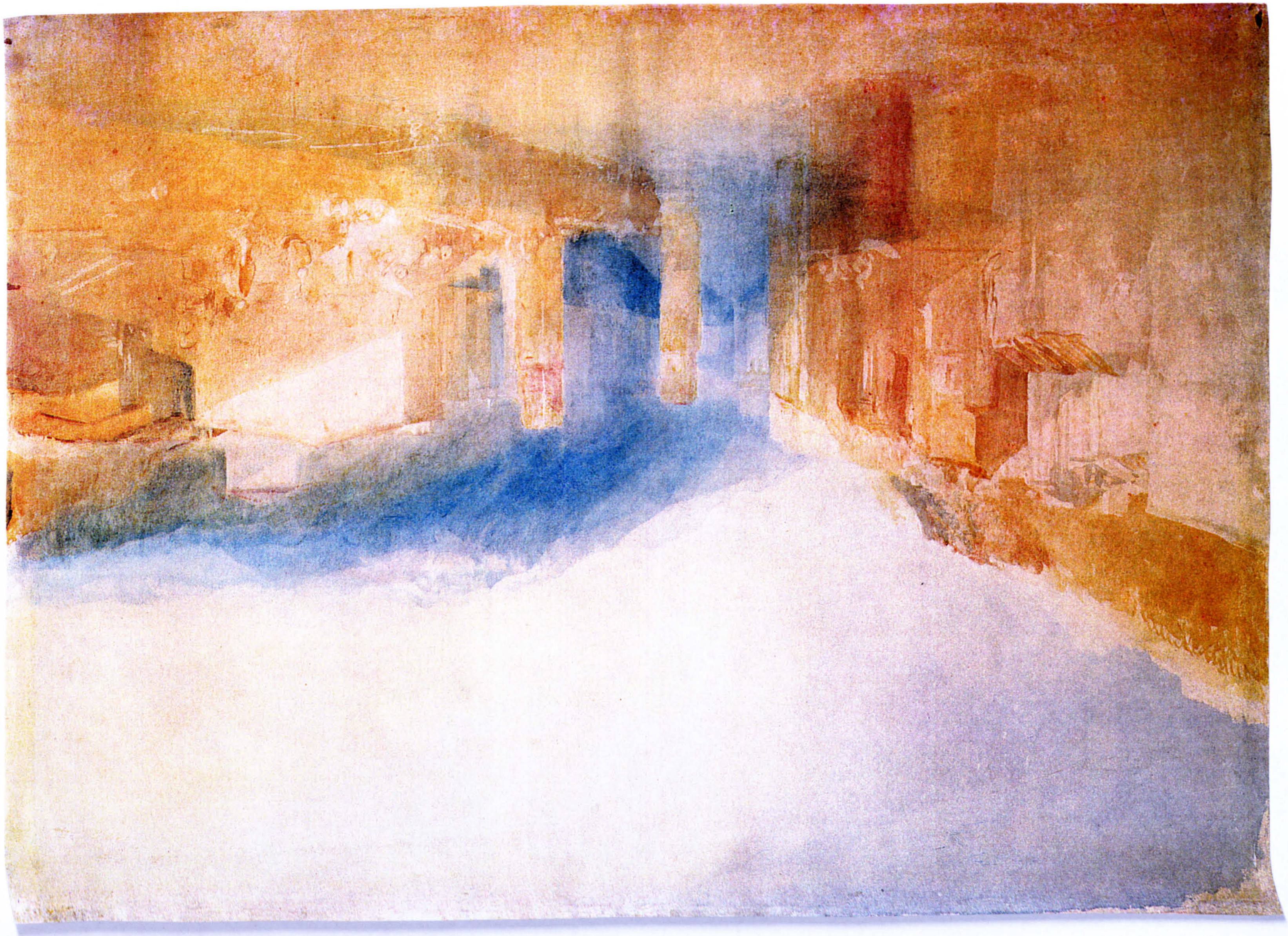

Fig. 59

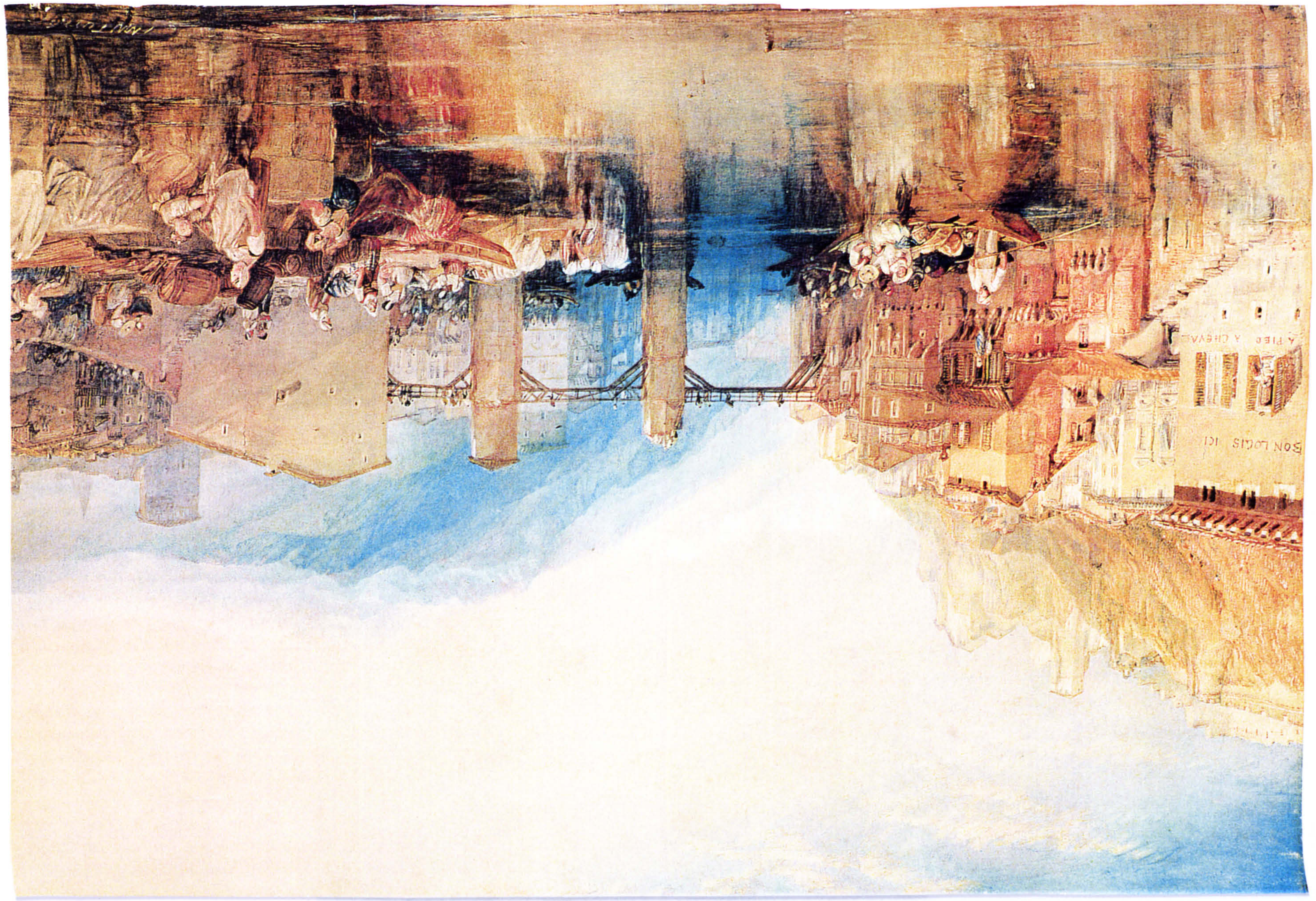

Fig. 60

Fig. 61

> falls; others cut sharp and clear with a knife from the wet paper, as in the housings of the mules on the mountain road; and then for texture and air there has been much general surface washing.[50]

The above techniques, like the following, must be taken in context with Turner's mastery of tonal control and articulation of colour to portray effects of recession and distance.

Perhaps the most exciting account of Turner modelling wet paint to create an image comes from his good friends the Fawkes family at Farnley Hall, Yorkshire in November 1818 where young Hawkey witnessed the evolution of *A First-rate Taking in Stores*:[51]

> One morning at breakfast Walter Fawkes said to Turner, "I want you to make me a drawing of the ordinary dimensions that will give some idea of the size of a man or war". The idea hit Turner's fancy, for with a chuckle, he said to Walter Fawkes eldest son then a boy of about 15, "Come along, Hawkey, and we will see what we can do for Papa" and the boy sat by his side the whole morning and witnessed the evolution of *The First-rate Taking in Stores*. His description of the way Turner went to work was very extraordinary; he began by pouring wet paint onto the paper till it was saturated, he tore, he scratched, he scrabbled at it in a frenzy and the whole thing was chaos – but gradually and as if by magic the lovely ship, with all its exquisite minutia, came into being and by luncheon time the drawing was taken down in triumph.

(See figs. 35 and 36.)

Turner's technique of "pouring wet paint onto the paper till it was saturated, tearing, scratching and scrabbling at it in a kind of frenzy" would be impossible to achieve on modern papers – their surface would disintegrate, chiefly due to the softer cotton rag content and weaker sizing and the speed at which they are manufactured.

Simplon Pass (fig. 62) has countless broken brush bristles embedded in the deeper tones of the pigment. As in many of Turner's watercolours, it appears as if he

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[50] Thornbury (1877:79).
[51] Gage (1987:159-160), quoting a memoir by Edith Mary Fawkes.

Fig. 62

has practically worn out a brush against very thin paper, yet there is no apparent damage to the paper's fibres.[52]

Bell, in *A List of the Works Contributed to Public Exhibitions by JMW Turner* (1901:8, 17), confirms the crucial role Whatman papers played in achieving such robust techniques:

> Such paper as this could not in any case have borne repeated washings, nor would sponging and scraping have produced upon it the effects to which Turner had recourse for the most original passages in his drawings. On Whatman papers, he found a perfect groundwork for these processes and he adhered to its use during the rest of his life … Turner was able to obtain many subtle effects of colour without the use of glazings, and his drawings, especially those of the *England and Wales* series, contain passages where form, modelling and tone have all, by dextrous wiping and scraping, been extracted from a simple wash of colour.

Here, Bell recognises the connection between Turner's "most original passages in his drawings" and the handmade linen rag Whatman papers he utilised.

Turner's ability to work quickly through a complex range of watercolour techniques in a straightforward manner without altering to destroy an effect is a testament to both his own skill and the papermaker's.

The following provide further examples of Turner's advice to both novice and professional alike; his methods of practice and how the tools he used influenced the latter. Here Jane Fawkes pressed Turner perhaps further than many would have dared to reveal his secrets:

> One of Mr Fawkes's daughters told me (Mr Leitch) that she was copying one of Turner's drawings and had a great deal of difficulty with one part of it. Her father saw how worried she was about it and said, "Jane, don't fret your life out about that drawing. You are going up to London in a day or two; you are taking Mr Turner his box of game and ever so many other things; just take them to him yourself and give my kind compliments, and ask him as a great favour to tell you his secret for doing this." So 'Jane' went with her good gifts, and was shown into the dull, dismal parlour, and then she gave her father's message. Turner answered her, "Make my kindest respects to Mr Fawkes, and tell him that the only secret I have got is d___d hard work". Not deterred by

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[52] Cohn (1977:46).

> this, she ventured to ask him another question. There were some very curious lights on the edges of some leaves in the drawing, and she begged him to tell her how they were done. "Keep it all wet, and go that way," said he, jerking about with his thumbnail.[53]

"Dip it in a jug of water" was another piece of advice dispensed by Turner to Miss Fawkes.[54]

Continuing in the same vein, Turner gave the following instructions to Mary Lloyd, a friend of the poet Samuel Roger's sister:

> First of all, respect your paper! Keep your corners quiet. Centre your interest. And always remember that as you can never reach the brilliancy of Nature, you need never be afraid of putting your brightest light next to your deepest shadow, in the centre, but not in the corners of your picture.
>
> People talk a lot about sunsets, but when you are all fast asleep, I am watching the effects of sunrise far more beautiful; and then you can see the light does not fail.[55]

Few people saw Turner working with watercolours outside in the landscape but an American artist (identity unknown), travelling with the English painter Samuel Prout (1783-1852) met him in Caen, France during the late 1820s and recalled,

> He sketched standing, painting the scene in water-colours, laying it in, in a broad sombre manner, manipulating with surprising celerity, and producing in half an hour a most surprising effect. But it was vastly *unlike* the original in detail; he had merely used the scene for its suggestiveness. I afterwards saw him dizzily perched in the crumbling turret of an old wind-riddled tower, shaded by overhanging ivy, and surrounded by a cloud of complaining rooks. He was laboriously sketching the minutest detail of a group of carved stones half hidden in moss and leaves.[56]

Half an hour or less is sometimes all it takes to express the idea in mind or record an impression as Turner reminded a companion during a summer tour in Devon 1813 that one of his oil sketches and perhaps the best had been completed in

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[53] TS Vol. 5 No. 2 p26: whilst Thornbury (1877:163, 348) noted that, "'Genius Reynolds had stated 'was only well applied industry' and this was echoed once again in Turner's remark, 'I know of no genius but the genius of hard work'."

[54] Falk (1938:95) and Hamilton (1997:264).

[55] Mary Lloyd, *Sunny Memories* (1880:31-38, privately printed, London). Republished as *A Memoir of JMW Turner RA by ML* (TS Vol. 4 No. 1 p22-23).

[56] Robert K Wallace, Northern Kentucky University, "Reminiscences of Turner from The Crayon", *Turner Studies* (1855 Vol. 8 No. 1 p46-47).

that time.

Another friend of Turner's, Hugh Munro of Novar, a keen amateur draughtsman himself, joined him on his 1836 Swiss tour and recalled:

> His first enquiry in the morning when they started to sketch was always, "Have you got the sponge?". It was with the sponge that he obtained many of his misty and aerial effects … On one occasion in the Aosta Valley, he was dissatisfied with a sketch, which he altered and sponged till the drawing got a sort of white greenness about it which was not pleasant … "I could have done twice as much with the pencil", he remarked. He had a horror of what he said Wilson called "being too mappy". He used no maul-stick; his touch was so sure and decisive, and his materials were of the rudest – brushes worn away to single hairs, and now thrice as valuable as they were when new.[57]

Drawing at the bridge of St Martin's, Munro got into great difficulty over a coloured sketch. Turner looked over him a little while, then said in a grumbling way, "I haven't got any paper I like; let me try yours". Receiving a block book, he disappeared for an hour and a half. Returning, he threw the book down with a growl, saying, "I can't make anything of your paper". There were three sketches on it, in three distinct stages of progress, showing the process of colouring from beginning to end, and clearing up every difficulty which his friend had got into. (R.VII p446, n.)[58]

The above confirms Turner's respect for his paper. His handling of the brush was sure and decisive and needed a firm surface to match. Sponging, it appears, can lead you into, as well as out of, trouble and, for all his skills, he knew the successful outcome of a composition was never guaranteed.

It was also in 1836 that the artist WL Leitch first met Turner. Leitch has already furnished us with information about Turner's practice in the medium from Fawkes' daughters. Here I believe are his most vivid insights into Turner's almost production-line methods of watercolour painting, recollected from a visit to his studio;

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[57] Thornbury (1877:104).
[58] Wilton (1987:178).

he states:

> There were four drawing boards, each of which had a handle screwed to the back. Turner, after sketching the subject in a fluent manner, grasped the handle and plunged the whole drawing into a pail of water by his side. Then quickly he washed in the principal hues that he required, flowing tint into tint, until this stage of the work was complete. Leaving this drawing to dry, he took a second board and repeated the operation. By the time the fourth drawing was laid in, the first would be ready for the finishing touches.
>
> Turner's method was to float in his broken colours, while the paper was wet, while several of his water-colours were in progress at the same time. He stretched the paper on boards and plunging them into water, he dropped the colours onto the paper while it was wet, making marblings and gradations throughout the work. His completing process was marvellously rapid for he indicated his masses and incidents, took out half-lights and dragged, hatched and stippled until the design was finished. This swiftness, grounded on the scale practice in early life enabled Turner to preserve the purity and luminosity of his work and to paint at a prodigiously rapid rate.[59]

The practice during Turner's era of drying papers slowly during their manufacture, and therefore resolving the sheets' tensions, enabled them to withstand the swift onslaughts Leitch describes.

Turner's final words on the subject relayed to Leitch in the 1840s still resonate with the youthful practices he described to Farington in 1799. Perhaps his best piece of advice to both novice and professional alike, it also reveals how he preferred to set himself up to work; Leitch,

> used to give an account of meeting him somewhere near London when Leitch was sketching a winter sunset. After putting down a few hasty washes, Leitch gave up the effort and asked Turner how he would have proceeded. "I would have gone home to bed," Turner replied, "and as soon as I was awake got up and put down my impression. (Leitch p110.)[60]

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[59] W Shaw Sparros, in Holmes (ed.), *The Genius of Turner* (1903:vii-viii). See also Shanes, "Turner and the Scale Practice in British Watercolour Art", *Apollo Magazine* (November 1997:45-51) and Gage (1969:32).

[60] Wilton (1987:236): In addition, Rawlinson (1909:33) noted when one artist complained to Turner of the disappointment he had experienced when revisiting a certain place, Turner replied, "Don't you know you must paint your impressions", or words to that effect. Bailey (1997:379) also states, "When Ruskin's friend, Reverend William Kingsley, visited Turner's gallery, he saw that a piece of paint "as large as a fourpenny piece had fallen from the sky of the oil painting *Crossing the Brook* and lay on the floor". "How can you look at the picture and see it so injured?" asked Kingsley. Turner is reported replying, "What does it matter? The only use of the thing is to recall the impression".

Memories and impressions like dreams in the night, with all their elusive and unpredictable power to transform a scene, are central to the understanding of Turner's practice.

The papers, paints and gum mediums he used became conductors and transmitters for his imaginative visions; they provided him with a whole range of technical options. However, employing a complex range of techniques was not always necessary; a few simple washes may be all that were needed to record an impression as the watercolour *Venice: the Fondamenta Nuova from near the Arsenal* (1819) (see fig. 63) demonstrates. Nevertheless, Turner still had recourse to a high degree of finishing in many of his watercolours – what Leitch referred to as 'stipple and hatching' and which we will now look at in detail.

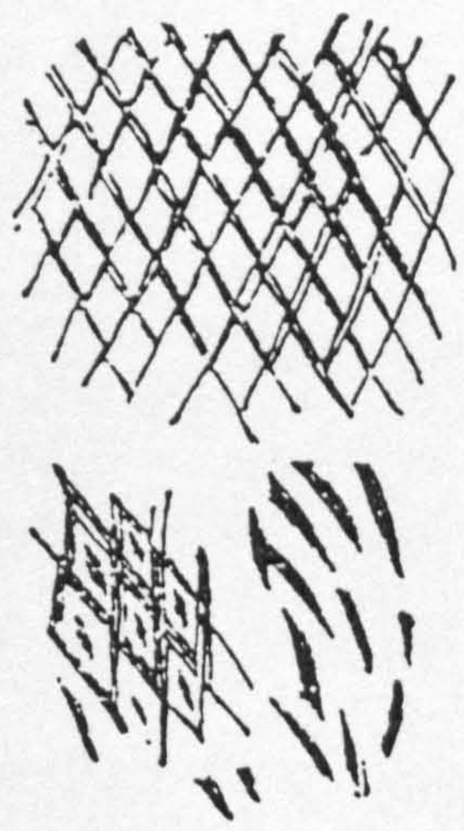
Stipple, hatching and drybrushing

Stipple and hatching may not have been the only watercolour technique Turner used but it was certainly one of, if not the most complex.

The technique consists of painting, with the point of a brush, marks of a watercolour paint which often look like finely chopped straw (see fig. 64). The tonal density of the marks can be controlled by the ratio of paint to water and by varying their degree of pressure when applying them on the paper. It can also help if the paint is nearly dry on the brush in order to produce crisp, sharp marks, or drybrushing. It is similar to drawing fine details with the point of a sharp HB pencil and the success of the technique is as dependent on delicacy as much as precision.

The watercolourist George Barnard (1807-1890) outlines in his book *The Theory and Practice of Landscape Painting in Watercolours* (1858:61-62) not only the crucial influence handmade papers had on Turner's watercolour practice but how

Fig. 63



stipplings and hatching

Fig. 64

the success of this technique could be helped by the unique surface texture offered by such papers. He states:

> The quality of the paper employed in water-colour is very important; it influences the whole picture in so great a degree as to require careful consideration. It represents the highest lights.
>
> Paper, for water-colours, consequently, should possess some of the qualities of the best white pigments used by the oil-painters. It should be of a pure white, so that the most delicate tints may be used on it without undergoing alteration; and opaque, in order that it may reflect the light falling on it, without much loss by absorption. The paper's surface free from sharp or angular depressions, the colour being apt to settle in these depressions, and cause spots which cannot be easily removed. Light falls on the varied surface of this description of paper with ever-changing degrees of intensity; and being reflected by it, causes much play and variety in tint on this uneven texture, yet allows the sight to pass, as it were, between the minute portions of colour, and gives them the effect of a pure stippled hint.

The implication of this is that once a watercolour wash is painted over such a surface, it produces an instant stippled tint. As Barnard observed,

> light falls on the varied surface of this description of paper with ever-changing degrees of intensity; and being reflected by it causes much play and variety in tint on this uneven texture, yet allows the sight to pass, as it were, between the minute portions of colour, and gives the effect of a pure stippled tint.

It is important to retain the luminosity and freshness of these early washes and tints for to muddy them could spoil the benefits of spatiality and distance implied by the final tonal recession. Another technique which can be brought into play at the early stage of a composition is the use of water to fade dry colour. For example, once a build-up of successive tints has established clouds, terrain, buildings and so on, the work may be submerged in a bowl of water and areas of paint brushed or sponged away; alternatively water can be pumped onto the surface. This is how Turner achieved many of his finely dissolving distances and other atmospheric effects[61]

When these tints have thoroughly dried the artist can return to work on top of them, otherwise if still damp they would blend with subsequent marks of colour. This

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[61] LW Pole, "Turner's Watercolour Technique: A New Interpretation", *Turner Society News* (No. 67. August 1994 p6).

can be a technique in itself if so desired and Turner employs it in areas of *The Dark Rigi* (1842) (fig. 2), for example in the water and in the dense opaque terrain.

Any of the above techniques, like the marblings of wet colour, can create spontaneous effects and accidents in the paint. These can be further enhanced with stipples and hatchings as the artist sees fit. Patience is the key word. Very small quantities of paint should be applied at a time and allowed to harden before re-working. Working too fast and indelicately will only produce a thick build-up of paint plus blurred and woolly results instead of crisp, sharp marks.[62]

Why stipple and hatch?

Turner often used stipples and hatchings of colour to suggest the motions and processes of a whole range of aerial and terrestrial phenomena. Distant bands of atmospheric vapour, broken clouds, hills, mountains, woods, rivers and seas, and any fine details that may emerge during a composition, could all be developed with immense delicacy and precision using this technique.

For example, initially a tree's form and foliage may be laid in or drawn with a flat tint of a rather light colour such as yellow ochre or raw sienna. As the image progresses, a whole range of mixed greens, secondaries, tertiaries, browns and black may be introduced. Branches can be scraped out in relief whilst colours are still wet; gradations reinforced or diminished. Lights can also be picked out of damp colour with the point of a brush to suggest glistening areas of foliage. The gradated parts of the trunk and branches can be enhanced with stipples and hatchings.

The outer extremities such as leaves, twigs, and the complex interplay of light and shade found with foliage, can also be embellished with stipple and hatching. In

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[62] See Sue Burton, *The Techniques of Painting Miniatures* (1995:19-29, Batsford Ltd).

addition, atoms and dashes of a rather dry colour may be placed cunningly into the interstices and over the top of these marks to compound the effect.

Using the point of a wet brush, it is possible to cut back through the superimposed colours to the one underneath, i.e. stipple and hatching in reverse. This creates further complexities of colour and form which lead the eye through deep passages of broken irregular gloom into entangled infinities. It may take between ten to twenty painting processes to arrive at the idea the artist has in mind. Combined, these techniques may be considered as a sublime labyrinthine complex which invites the eye to wander in – see for example the trees and foliage in *Prudhoe Castle* (1825) (fig. 18).

Compound colours

A compound of stipples, hatchings, atoms and translucent glazes of colour produce an opaque section of paint, often indefinable in tone. Unearthly conjunctions of colour are created as complementaries clash with primaries and tertiaries to shimmer in the viewer's eye. An optical flux is created which oscillates on the paper like iridescent shells or peacock feathers. The multifarious surface texture of the paper employed not only alternates by subtle degrees the interplay of tints and their colour intensity, but reflects light back through the paint films rather than absorbing it.

Ruskin, in his book *The Elements of Drawing* (1857:155), describes the effect of compound colours in the following terms:

> Notice also that nearly all good compound colours are odd colours. You shall look at a hue in a good painter's work ten minutes before you know what to call it. You thought it was brown, presently you feel that it is red; next that there is, somehow, yellow in it; presently, afterwards that there is blue in it. If you try to copy it, you will always find your colour too warm or too cold – no colour in the box will seem to have an affinity with it; and yet it is as pure as if it were laid at a single touch with a single colour.

The above succinctly defines many of the sections found in Turner's watercolours, not least in the form of *The Dark Rigi* and its reflections in the lake (fig. 2; see also figs. 140-142, author's own studies).

A warning

Here it is worth stressing that an obsessive use of stipple and hatching can descend into mannerism, killing spontaneity and producing damaging optical mixtures. Instead of creating luminous colour effects to enhance form and meaning, overwrought combinations of primary and complementaries – red, green, violet, blue, orange – will actually nullify each other, producing a grey or brown mud.[63]

In his RA Lecture V (1818),[64] Turner deals with the above problem faced by most painters - the combination and corruption of colour. Indeed, he quantifies the whole area as indefinable. He states, "If we mix two, we reduce the purity of the first; a third impairs that purity still more; and beyond is monotony, discord and mud".

However,

> ... there is another combination of colouring [to be added], viz. the union of the many to produce the general tone, perhaps better called the combination of colour [and] sometimes historic tone. The corruption of colours, inasmuch as the one is [the] means used, [or] sought for, [is] positively indefinable.
>
> This tone denies to theory the least indulgence. It is here referred to inferences only of what may yet be done. Theory can only refer instruction to informers by what has been done; by some having been more fortunate in combinations of colouring than others.

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[63] *Colour, Art and Science* (1997:28, CUP). Signac, Seurat's fellow neo-impressionist, believed obsessive pointillism killed spontaneity and careless optical mixtures actually killed colour. In 1894 he said,

> Pointillage simply makes the surface of the paintings more lively but it does not guarantee luminosity, intensity of colour or harmony. The complementary colours, which are allies and enhance each other when juxtaposed, are enemies and destroy each other if mixed, even optically. A red and green, if juxtaposed, enliven each other; but red dots and green dots make an aggregate which is grey and colourless.

[64] Lecture V (1818, BM Add, MS 46151, H, ff.25v-41v), cited by Gage (1969:202); *Supplements to Lectures on Light and Shade and Colour* (1827?, BM Add, MS 46151 BB, ff.66-9), cited by Gage (1969:209-211).

The problem of combining colour cannot be solved by following the "mechanical principles" stipulated by the "Science" and "Theory of Art" for they "could but generate manner instead of style". The artist has to find his own way through the complex labyrinth of colouring, guided by his imagination and what "nature" and "her effects" have to "offer daily". He can also acquire practical knowledge by studying those masters who have been fortunate in combining colour, to try and 'crack their code', as it were. Here Turner cites, "Titian chose rightly in his third style of colouring … through all the glowing brilliance of combinations, full, deep, rich, pure colouring".

Ruskin too had a high opinion of this master and what could be achieved through interlacing touches of pure colour with mixed tints, stating, "Titian's way of blending colours, which is the perfectly right one, is not understood now by any artist. The best colour we reach is got by stippling, but this is not quite right"; "To do it well is very laborious and requires such skill and delicacy of hand as can only be acquired by unceasing practice"; and crucially, "if you cannot choose and harmonise colours by instinct, you will never do it at all".[65]

Turner goes on to describe practical examples of colouring and the handling of light and shade by the Dutch, Venetian and Bolognese school and masters, including Correggio, Rembrandt and Rubens.

The "Science" and "Theory of Art" took secondary roles to practice, "for practice must in some cases precede theory. If not, too much time would be lost to obtain that theory, which would arrive too late for practice".[66]

His concern as a practical colourist begins with the acknowledgement that

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[65] Ruskin, *The Elements of Drawing* (1971:151 and 155).
[66] Gage (1969:202).

colour's power – like life itself – is triggered by daylight. He refers to the primaries – red, yellow and blue – as "primitives" and "compounds" – orange, purple, green - and that these colours may be seen "in succession" by the passing of a "ray of light" through a prism or in a rainbow (in a later lecture, he adds the "crystalline medium" of the human eye).

For Turner, yellow functioned as light – *the* medium in aerial perspective and the closest colour in the spectrum to daylight; red was material and blue indicative of distance. These three colours and their combinations are evident in the daily operations of nature between the "yellow morning" through to the "red departing ray", the commixture of material colours red and blue produced darkness.

The above colours, their "gradations", "subduction", "inversions" and employment in chiaroscuro – i.e. to represent the effects of light and shade – "opened up an immense field of combination of the primitive and comparative colouring".

In practice, Turner found immense combinations of colour transmitted in the "reflections" and "refractions" of water, air and vapour; he even found them in earthy, dense material and opaque terrain. For, indeed, Falk cites a client of Turner's complaining, "After all cliffs are only chalk and stone and grass. I can't see those wonderful blues and reds and yellows in the combination". Turner is reported replying, "H'm but don't you wish you could".[67]

Someone who could see those wonderful blues, reds and yellows in both nature and Turner's work was the watercolourist George Barnard. In the following extract taken from the second edition of his book (ibid. 1861:118-120), he not only pays homage to Turner's stipple and hatching but reminds us of the benefits and

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[67] Falk (1938:153).

pitfalls of the technique. He compares it with a wide range of effects, possible sources and phenomena; in sum, it serves to re-cap the salient points of a complex technique:

> Stippling is a mode of blending colours one with another by interlacing them, or placing small portions of pure pigments side by side, so that the eye, passing rapidly from one to the other, unites them, and thus produces the same or perhaps more powerful effect than a mixed tint. One colour may thus be considered to be broken by a second, or even by more. This process has been used from the earliest oil painters until now, when it appears to be more particularly practised by the water-colour school. Turner has given us examples of most successful stippling; and by using it has often gained a beautiful harmony and variety in his colouring.
>
> ... By the employment of this mode of handling, a play of colour is given that is extremely agreeable; it may be compared to the effect, but much more refined, of shot silk. After the monotony of a flat tint, the variety and relief afforded by stippling on some additional colour is very great. Lines and forms can be indicated with just so much distinctness as is necessary; and by adding to the intricacy without disturbing the breadth, the eye penetrates these tints with the same pleasure that it searches into the undulating distances in nature; by it the general tone can be gradated to the extremest depths, yet without approaching blackness, for pure colour, although dark, will always be there. Colour that is crude or wrong can also be altered without the disagreeable and doubtful process of washing out: Thus, if a mountain side in shadow be too cold or blue, a little brown madder may be stippled, either in flakes, long or short, side-by-side, or crossed in diamond forms. If thus, it is sometimes called hatching; the interstices are also often filled up with some other colour, or small dots are filled in, as we see in fine line engravings. Should a slight green be wished, the blue or purple hue may be further broken by stippling in a pure yellow. In stippling, beware that the lines do not obtrude themselves too much: They would then degenerate into mannerism. Some degree of firmness is necessary but the lines or dots should all have a certain reference to the general direction of the surface. An excellent example of the effect produced by skilful hatching or stippling, and thus varying the one, may be seen in a fine water-colour drawing by Turner exhibited at the Art Treasures Exhibition in Manchester, 1857, called 'Bamborough Castle'. Sometimes, a few well-placed strokes of nearly pure red are hatches over a floated blot of cool grey, giving a fine warm glow to the lighted side of some cloud; at other times, a ruin, evidently blotted in with nearly the same tint as

> the sky, is made to relieve considerably warmer by the sky being stippled down with nearly pure blue.[68]

If Barnard can succinctly describe stipple and hatching and Turner's use of it, then I believe it is fitting for Ruskin to broadly summarise his watercolour techniques as a whole. We should remind ourselves that Ruskin was not only a competent watercolourist himself, but knew Turner for the last ten years of his life and had intimate access to his works in the Bequest after his death. He states,

> The large early drawings of Turner were sponged without friction, or were finished piece by piece on white paper; as he advanced he laid the chief masses first in broad tints, never effacing anything, but working the details over these broad tints. While still wet, he brought out the soft lights with the point of a brush, the brighter ones with the end of a stick; often too, driving the wet colour in a darker line to the edge of the light, in order to represent the outlines of hills. His touches were all clear, firm, unalterable one over the other: friction he used only now and then, to represent the grit of stone or the fretted pile of moss; the finer lights he often left from the first, even the minutest light, working round and up to them, not taking them out as weaker men would have done. He would draw the dark outlines by putting more water to wet brushes, and driving the colour to the edge to dry there, firm and dark. He would draw the broken edges of clouds with a quiver on the brush, then round the vapour by laying on a little more colour into parts not wet, and lastly dash in warm touches of light when dry on the outside edges.
>
> In his advanced stage, and in finished drawings, he no doubt damped and soaked and pumped on his paper, so as to be able to work with a wooden point. The superfluous colour he would remove, but he never stifled or muddled one tint with another; nor would he use friction so as to destroy the edge and purity of a colour…
>
> In many cases the instantaneous manipulation is quite inexplicable; for instance, I cannot conceive by what treatment of the colour he obtained the dark and exquisitely broken edge of a wave in the first drawing in the frame No. 65…"

Once the primary modifications of wet colour had been made,

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[68] Turner had studies in galleries and private collections oil paintings by Rubens and Titian (among others) who employed discrete patches and marks of colour in their works. Gage (1987:89) suggests he may also have seen examples of stippling and hatching in the works of watercolour miniaturists such as JB Isabey and WH Newton who exhibited around London in 1818 and the 1820s. Other nineteenth century watercolourists such as Miles Birket Foster, William Hunt, Marcus Stone, and so on, incorporated stipple and hatching in their works; (it can also be found in medieval and renaissance works, i.e. Limbourgs *Book of Hours*). I believe, even accounting for shared similarities and influences, each artist evolves their techniques differently without recourse to a singular, reductive, genealogical source, yet certain papers and paints outlined herein help facilitate the same. For more, see Gage, *Colour and Culture* (1993) and "Colour in History, Relative and Absolute", *Journal of the Association of Art Historians* (March 1978); Kemp, *The Science of Art* (1992).

The drawing was proceeded with exactly in the manner of William Hunt, of the old Watercolour Society (if worked in transparent hues), or of John Lewis, is in opaque; that is to say with clear, firm and unalterable touches one over another, or one into the interstices of another.

His finer vignettes (as for his Milton) are on smooth cardboard, his coarser ones on sheets of thin drawing-paper; and in some of his sketches he would colour on both sides, so that the paper could never have been soaked. There is no doubt, too, that besides his work on wet paper with wooden point, and his wonderful method of taking out highlights with bread, he had many secrets of manipulation, as, for instance, in imitating the dark broken edges of waves. In an Italian drawing that Mr Allnutt now possesses there is an evident intentional graining given to a large block of stone in the right foreground by the pressure of a thumb in half-wet colour. You can still see the impression of the pores of the painter's skin.[69]

Ruskin's vivid summary acknowledges Turner's central impulse to go straight to his mark without recourse to alter. He readily admits that he "cannot conceive by what treatment of colour he obtained" certain techniques and effects. Some of these gaps have been filled by others in this chapter, including Turner's own words. The following will continue to unravel the crucial connections between Turner's philosophy of practice and the tools he used in order to produce innovative watercolours at such a prolific rate.

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[69] Thornbury (1877:78-79 and 508-509).

Chapter VI

Making paper like Turner's

Between 1985 and 1990, whilst employed as a artist's draughtsman and producing my own work, I continued to experiment with a wide and diverse range of contemporary watercolour papers – Saunders, Fabriano, Arches, Whatman, Two Rivers, among many others. I attempted to work these papers as I assumed Turner himself had done, using Winsor and Newton and Rowney watercolour paints. However they produced the same disappointing results, as the following experiments show.

In 1987 I attempted to copy faithfully Turner's watercolour *The Dark Rigi* (1842) (fig. 2, fig. 68 own version) in the study room of the Laing Gallery, Newcastle, with a view to further understanding the techniques and processes involved in constructing the original.

I selected a contemporary Arches, 140 lb., HP surface to paint my copy – it was evident by the edge of the work that Turner had selected a lightweight paper, approximately 90 lb., for this work. I used Winsor and Newton watercolour cakes: yellow ochre, chrome yellow, ultramarine, Prussian blue, indigo and light red, which matched the colours Turner used but not the pigments' characteristics.

My attempt on the Arches paper achieved an overall likeness in colour but when I tried to build up the image and depth of tone by placing layer upon layer of colour washes and to emulate his minute dashes and strokes of colour stippled and hatched (see fig. 69) in parts, like finely chopped straw to establish details, the paper and paints failed

Fig. 68

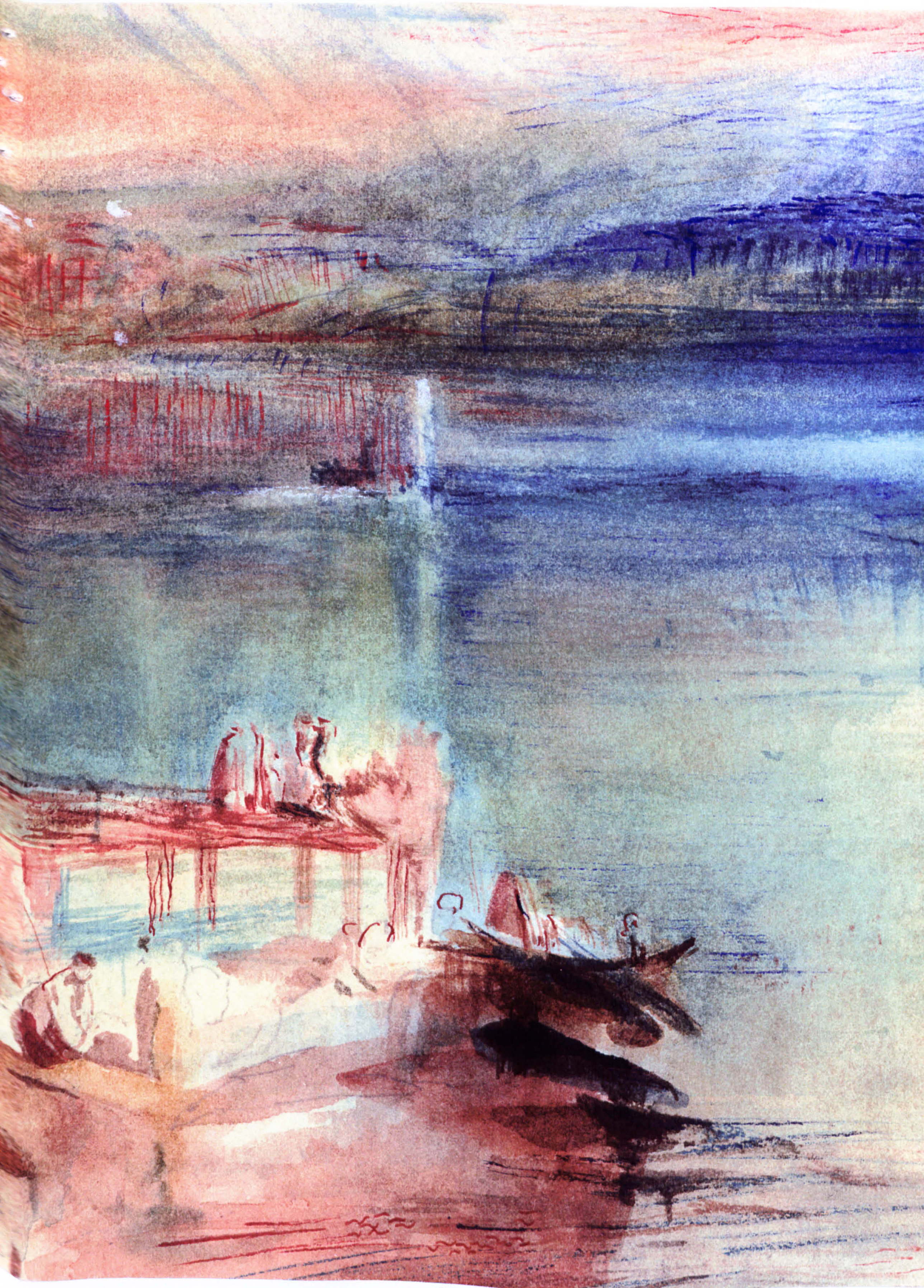

Fig. 69

miserably. Its surface disintegrated after repeated soaking of watercolour, details became woolly and blurred and depth of tone was seriously short of the original.

It became increasingly apparent that Turner could not have produced as many intricate watercolours as he did and at such a prolific rate if he had used modern materials, such as Arches and the other papers cited in this chapter, with Winsor and Newton watercolour paints.

How and why Turner became so prolific in the watercolour medium has received little attention until now, yet it is a central facet to his career. Studying *The Dark Rigi* helped to trigger this research project and that work, among others, will be examined in more detail in Chapter VIII.

Thomas Girtin's (1775-1802) watercolour *Morpeth Bridge* (1802) (fig. 70) was another work I studied at the Laing Gallery, built up chiefly with precise flat washes of colour: his use of cartridge paper was noted in the introduction in 1805 by Opie and Callcott. The gallery's collection also included watercolour miniatures by John Martin (1789-1854), another of Turner's contemporaries. His highly detailed and delicate works once again provided evidence that the finished effects depended as much on the papers and paints he selected as his own skill. Like Turner, he had a choice which does not exist now.

In 1988 I attempted a faithful study of Marcus Stone's (1840-1921) watercolour *Lady Reading by Lamplight* (not dated), Shipley Gallery, Newcastle (fig. 71) and 1989, Miles Birkett Foster's (1825-1899) watercolour *Entrance to the Grand Canal, Venice* (c1868, fig. 72) in the study room at Sunderland Museum. Both works contained striking examples of stipple, hatching and wash techniques and once again the modern papers and

Fig. 70

Fig. 71

Fig. 72

paints I selected - Saunders, Fabriano and Winsor and Newton – proved totally inadequate. I believe that they were a fair selection from the range of contemporary papers available, having consulted various paper suppliers and artist suppliers for their advice on the matter, as well as using my own eye and judgement.

Differences between the papers Turner used and those available now

The main difficulties I found with modern papers was that their absorbency caused the watercolour to sink into the paper rather like blotting paper. Their surfaces disintegrated too easily after repeated soakings of colour, making crisp, sharp details appear blurred and woolly.

Bernhard Brett, in his book *History of Watercolour* (1984:12) refers to the differences between contemporary and nineteenth century papers, describing some of the difficulties I had already encountered using cotton based papers. He states,

> The best quality watercolour papers were handmade from white linen rags and are immensely superior to machine-made papers produced from cotton fibre or wood pulp. Linen papers take washes well and withstand rough treatment; colour on them has a brilliant fresh appearance. Cotton papers are difficult to moisten and unsuitable for washes; colour on them appears dull and lifeless. Those made from wood pulp preclude all depth of tone and in a short time turn yellow and brittle.

A conservationist, Marjorie Cohn, in her book *Wash and Gouache* (1977:20), noted,

> Paper made from linen rags was generally agreed to withstand washing and sponging better than any other kind and to scrape and cut with a clean edge, whereas paper made from cotton was considered, simply, cottony. Manual writers warned that cotton paper fibres would fluff up and cause the colours to blot.

Later I found the artist Samuel Palmer (1805-1881) discussing in a letter to Richard Redgrave the advantages of using London board, a laminated ply of handmade, often Whatman papers, pasted together with glue; he noted that it,

> . . . reflects light through the pigments. It shows the full depth of the colours laid on and as you retouch with more colour, the retouchings are still darker, as one would suppose they naturally must be. In the modern papers, you come to a full stop at a point far short of the depth of the pigment – in fact it is an ocular paradox.[1]
>
> The above quotes sum up succinctly what I had felt all along – the differences

which exist between linen- and cotton based papers and the reversal in papermaking practices and technology that contributed to the ocular paradox described by Palmer. However there were no suggestions from any commentators, academics or other artists as to what could be done to change this situation, a crucial concern that signified a serious problem.

I continued my quest for suitable papers. Art conservationists Allyson McDermott (Rowlands Gill, Durham) and Ranson Davies (Conservation lecturer, Northumbria University) supplied me with a few fine pieces of 1820s Whatman, among other papers, for trials. Although some of their sizing had evaporated through ageing, they did produce vibrant, luminous colour washes and a surface firm enough to establish crisp, sharp details.

John van Oosterom of JVO Papers, London, supplied Bally Ellen and Steart 1820s paper (a maker whose papers Turner used), Whatmans 1790s, 1911, 1920s, 1930s, Unbleached Arnold, 1930s. However most of the samples proved to be absorbent printing papers and therefore unsuitable for watercolour painting. Other suppliers, such as Falkiner Fine Papers, Lapis and Green and Stone in London, proved just as disappointing, confirming that finding fine papers was and still is extremely difficult.

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[1] Bower, "The Evolution and Development of 'Drawing Papers' and the Effect of this Development on Watercolour Artists 1750-1850", *Studies in British Paper History: Volume 1*, The Oxford Papers (1996:69).

Alan Witt, Business Manager at Whatman Papers (Maidstone, Kent) had warned me of this as early as November 1985; he stated, "Whatman commenced paper manufacture in 1740 and continued until around 1960. We came back in 1983 with a range of watercolour and printmaking papers", and on the subject of their earlier papers Turner used, "If you come across one, you should consider yourself very fortunate."[2]

Five years later Simon Green of Hayle Mill, Barcham Green Papers, in April 1990, summarised the position I was in and why:

> I am afraid that you are not going to find a contemporary paper that meets your requirements. We were unable to get white linen rags from the mid 1960s and the same would apply to any other manufacturer. Also very few people have gelatine-sized paper since about 1970 and this was a particular characteristic of nineteenth century papers.[3]

Undeterred, I communicated with papermakers and mills from many different countries and experimented with their papers, including Jacques Brejoux, Angouleme and Richard de Bas in France; the Cartiere di Amalfi, Fabriano and Cartiere Enrico Magnini, Italy; the Lessobo Mill, Sweden the Papeterie St Giles, Canada; and Twinrocker and HMP Papers, USA, among many others.

I concluded from the above that making fine papers as Turner and other watercolourists worked on in the nineteenth century had been a highly skilled practice and contemporary papermakers and mills do not have the time, expertise or incentive to make such labour intensive papers, not to mention access to raw materials such as old, used and worn linen rags for paper pulp.

I determined not to give up and accept what the market deemed suitable to buy. The years 1989 and1990 proved to be an important breakthrough.

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[2] Personal communication.
[3] Personal communication.

In January 1989 I visited the Clore Gallery, London (opened in 1987) for the first time where many of Turner's works bequeathed to the nation are housed. Since then I have returned throughout the 1990s to make notes and study specific watercolours in the study room and on exhibition, including *Norham Castle* (1823) (figs. 3 and 4), *Rivers, Harbours and Coasts,* and late *Swiss Series*, among others.

It was during my first visit to the Clore I was given the address of Peter Bower, a forensic paper analyst, historian and papermaker who was engaged in a sheet-by-sheet examination of the 20,000 or so works on paper in the bequest, the results of which are outlined in his two publications *Turner's Papers* (1990) and *Turner's Later Papers* (1999). We corresponded and, on a return visit to the Clore later that year, looked at a range of Turner watercolours. Bower increased my understanding of how specific characteristics found in the handmade papers Turner selected helped him to produce his innovative watercolour effects. What these characteristics are, and why they are different from those found in modern papers, are further outlined in the following.

The importance of Whatman handmade papers

During the 1980s and 1990s I became familiar with the following advert promoting Whatman paper:

> James Whatman commenced making paper in Maidstone in 1740. Within a few years, he had established his mill as one of the world's most famous. His invention of wove papers (as opposed to laid, which possess a pronounced wire mark) enabled artists to develop watercolour techniques hitherto impossible. The brilliance of the paper led to the use of transparent colours typical of the eighteenth century watercolour school. Whatman papers were much used by Turner, Gainsborough, Cotman and others. Writing and document grades were used by Washington, Napoleon and Queen Victoria. Hence the Whatman legend was born.

Springfield Mill was built in 1805 and the famous paper made there until 1963. Now once again Whatman Paper Limited is manufacturing a range of artists papers. All are made with 100% rag content, acid free with deckle edges and the Whatman watermark which has been the guarantee of excellence for almost 250 years.

(See fig. 12.)

The above implies that Whatman's modern papers (like Arches, Saunders and so on) possess the same characteristics as those which established their reputation. This, as we shall see, is untrue.

Focusing on Whatman papers will serve to exemplify the best in the papers Turner used, however this by no means diminishes the qualities inherent in other makes he selected, such a Portals and Bally Ellen and Steart, among others.

Whatman wove papers (see fig. 73) remained a central choice throughout Turner's career, evident in the watermarks of the sheets he selected. However, to state that Turner used Whatman paper is like saying someone drives a Ford car, it does not describe the actual model, year and capability. There is a whole range of variable characteristics inherent in a sheet's manufacture which will become clearer in the following section "Making Paper like Turner's".

Crucially, Whatman papers embody a large part of what CF Bell referred to in the introduction as the revolution in artists' materials that took place during Turner's youth. They contained the best of past and contemporary technological innovations absorbed and developed from a whole range of cultures.

It is no surprise that the make is probably the best known in Britain, if not the world, or used to be; its popularity is well documented throughout the nineteenth and twentieth centuries in various artists' manuals. LA Doust in *A Manual on Watercolour*

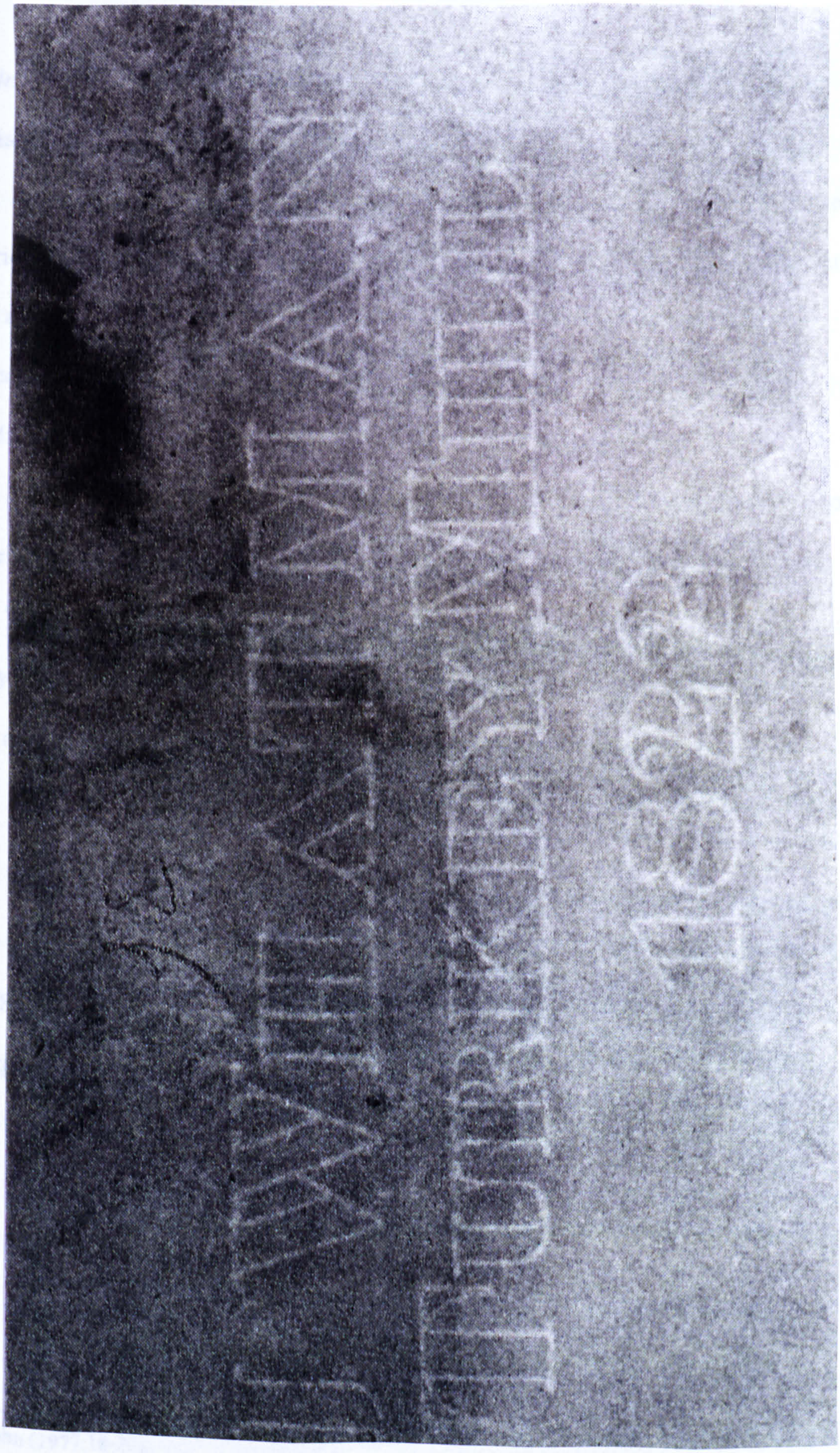

Fig. 73

Drawing (1933:12) noted, "The best and proper paper for all serious efforts at finished work is Whatman's specially made watercolour paper."[4]

As it happens, during Turner's era, many of the papers he chose to work on were not strictly designed for watercolour painting but as writing papers which could withstand sharp, abrasive pen nibs and, as such, were eminently suitable for the rigours of watercolour painting, as Mr William Enfield remarked in the *Elementary View of the Fine Arts* (1809), "Any paper that will do for writing will do for drawing".[5]

AJ Finberg, in his book *Turner's Sketches and Drawings* (1910:19, 48), refers to Turner's use of Whatman papers; commenting on the contents of a 1794 exhibition, he states, "Paul Sandby had two views of Rochester Castle, and A View of Vintners at Boxley, Kent, with Mr Whatman's Turkey Paper Mills where the excellent paper upon which almost all Turner's drawings were made was manufactured", and on page 48,

> The other book, the 'Dunbar' sketchbook, as Turner named it, consists of leaves of stout Whatman coated with washes of a murky pinkish brown. The advantage of using white paper prepared in this way is that the artist can get his lights by simply using his knife (or point of a damp brush) to scratch away the preparation.

CF Bell, in *A List of the Works Contributed to Public Exhibitions by JMW Turner* (1901:8, 17), confirms the crucial role Whatman played in achieving his watercolour techniques. Bell states,

> Such paper as this could not in any case have borne repeated washings, nor would sponging and scraping have produced upon it the effects to which Turner had recourse for the most original passages in his drawings. On Whatman papers, he found a perfect groundwork for these processes and he adhered to its use during the rest of his life…
>
> Turner was able to obtain many subtle effects of colour without the use of

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[4] See Cohn (1977:18-20).
[5] Cited by Bower (1999:36). Drawing during Turner's era was also a synonym for watercolour painting.

glazings and his drawings, especially those of the *England and Wales Series*, contain passages where form, modelling and tone have all, by dextrous wiping and scraping, been extracted from a simple wash of colour.

The above succinctly highlights the crucial role Whatman handmade papers played in Turner's ability to produce his most original passages and subtle effects of colouring. Turner was well aware of the importance papers played in his watercolour art; he could tell a bad sheet from a good one, as Ruskin reported in the last volume of *Modern Painters* the following incident which took place on a sketching tour of the Alps, 1836, near Salanches:

> Drawing with one of his friends, Mr Munro, at the bridge of St Martins, the friend got into great difficulty with a coloured sketch. Turner looked over his a little while, then said in a grumbling way 'I haven't got any paper I like; let me try yours'. Receiving a block-book, he disappeared for an hour and a half. Returning, he threw the book down with a pout, saying, 'I can't make anything of your paper'.[6]
>
> Presumably the paper was not a Whatman or any of his other favourites.

Whatman paper

The history of Whatman papers has been dealt with elsewhere[7] but it is of some interest to note a certain George Gill had been making paper at Turkey Mill, Kent from 1680. His son continued ownership of the mill until 1729 when he sold it to a Richard Harris. When Harris died in 1739, his wife Anne re-married a year later to James Whatman, a neighbour who had run the Hollingbourne paper mill since 1733.

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[6] Thornbury (1877:303).
[7] See J Balston, *The Elder James Whatman* (2 vols., 1992, Kent); *The Whatmans and Wove (Velin) Paper*, (1998, Kent); I Balston, *James Whatman, Father and Son* (1957); *William Balston, Paper Maker 1759-1849* (1954).

It is James Whatman who is credited with the introduction of wove paper around 1756 (though it was not until 1778 that it came into repute) to rid paper of lines indented on the surface caused by the laid mould (see fig. 74)[8]. This was a major innovation and how it evolved is still unknown, but his visit to Holland during the 1740s, where paper was already being made to a high standard, may have inspired his already experimental nature. Certainly the cloth-like surface of the wove paper mould (see fig. 75) required a finer pulp in order to be successful, a requirement supplied by the Hollander beater (fig. 76) which, as its name implies, was invented by a Dutchman whose name has been lost to posterity.

The Hollander revolutionised papermaking by replacing the medieval 'stamping' method whereby pulp was beaten by large hammers, often water-driven. The German natural philosopher and alchemist Johann Joachim Becher (1635-1682) noted its importance in 1682:[9]

> In the ordinary method, the rags are beaten with many stampers and much rattling. I have seen, however, a new kind of paper mill, in Serndamm in Holland, which operates not with crude stampers but by the use of a roll, and within a short time, without difficulty, the rags are macerated to a pulp.

As Hunter, in *Paper-making* (1978:163), states, "One Hollander was capable of preparing the same amount of material in 5 or 6 hours as could have been macerated in the old style stampers of 5 vat holes in 24 hours".

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[8] Bower, in his book *Turner's Papers* (1990:33), notes that the price of wove paper in the 1750s was three shillings a quire (approximately 24 sheets). In 1767, the artist Thomas Gainsborough, who had been greatly excited by the first wove papers he had come across, was prepared to pay a guinea per quire for a dozen quires of it.

[9] For more on Becher as an exponent of productive knowledge, see Pamela H Smith, *The Business of Alchemy* (1994, Princeton University Press).

1 Laid papermaking mould and deckle

Oak, pine, copper and brass

Two sheet mould: outside dimensions: 426 × 1072 ($16\frac{3}{4} \times 42\frac{1}{4}$)
Chain lines: 32 mm ($1\frac{1}{4}$ in) apart

Laid line frequency: 8 per cm (10 per in)[1]

Deckle: outside dimensions: 457 × 1078 (18 × 43)

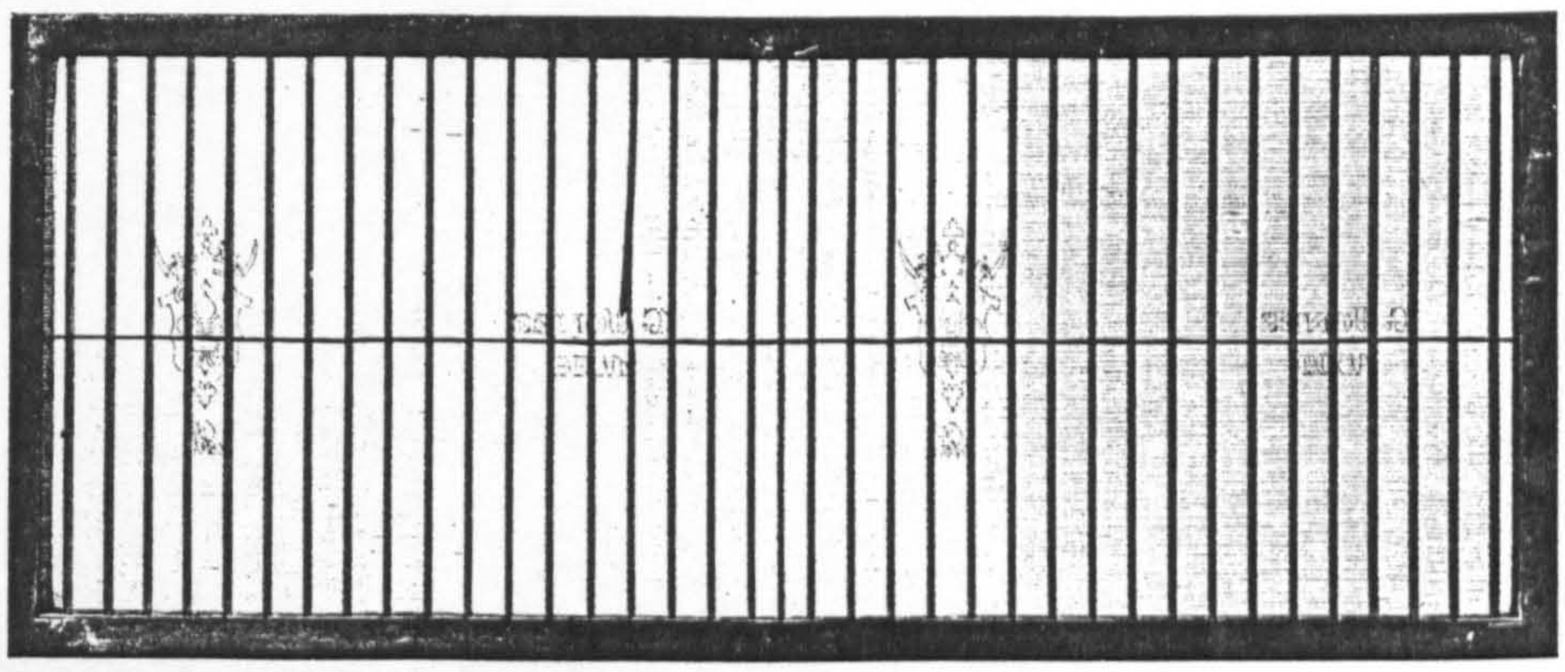
Watermarked: (once in each sheet) Fleur de lys, on a shield, crowned, plus a GJ monogram.
Countermarked: G JONES / 1809[2]

The mould carries the makers name on a small brass plate reading DONKIN & DAVIS[3]

Peter Bower

1A Detail of Watermark and reversed monogram

This mould was designed to produce two sheets at a time, each 393 × 510 ($15\frac{1}{2} \times 20\frac{1}{8}$), when wet, a size of paper known as Post. This is a single faced mould, where the laid wire is sewn down directly onto the struts. A single faced laid mould such as this produces a sheet, which when held up to the light would have darker shadows either side of the chain lines. Around 1800, probably as a development borrowed from the design of the newer Wove moulds (see cat.no.2), double faced laid moulds were introduced. In these moulds the laid wire was supported on the struts by a second set of wires, to hold the actual papermaking surface away from the wooden struts, allowing the water to drain away more easily during the formation of the sheet. This stopped the build-up of pulp either side of the chain lines, which had led to the creation of the shadow marks. There is a strengthening bar running the full width of the mould, through the struts, which are $1\frac{1}{4}$ in apart. One rib is damaged and the centre bar of the deckle is missing.



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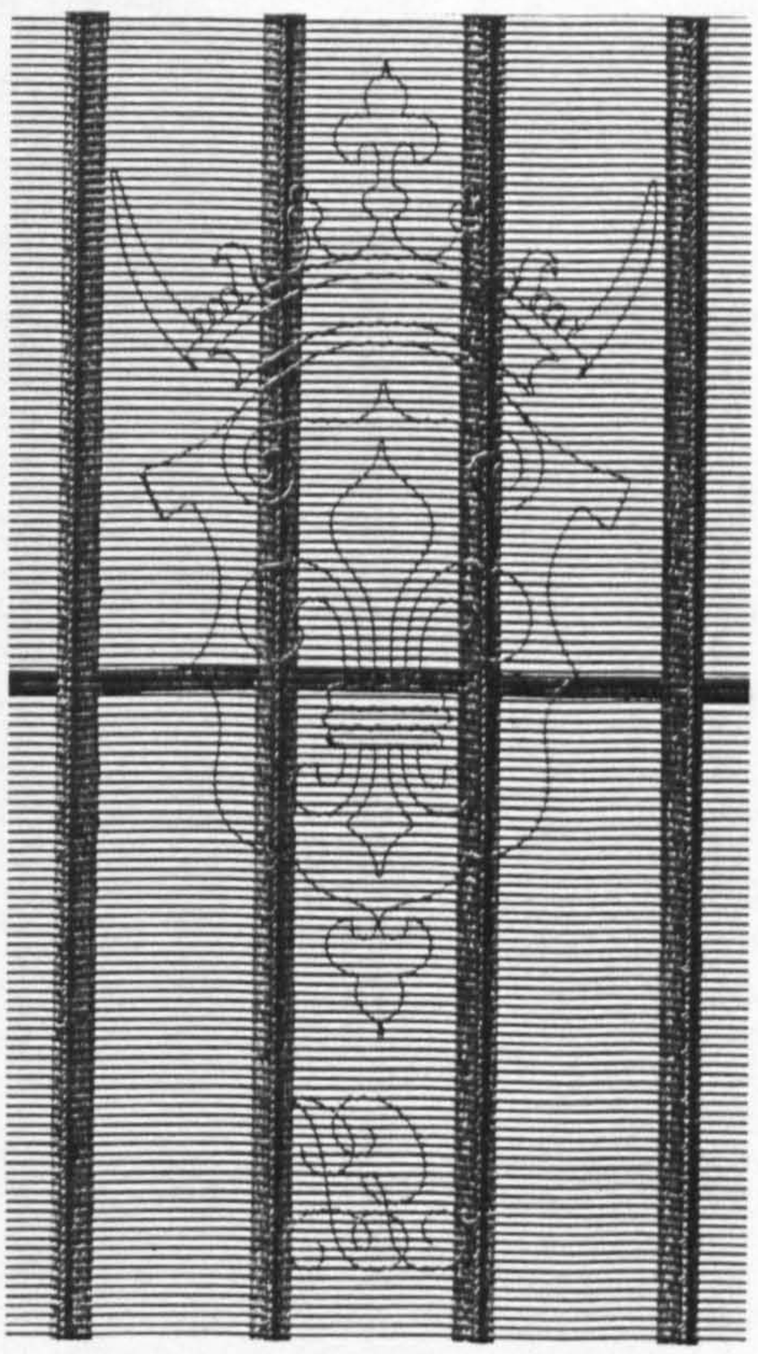
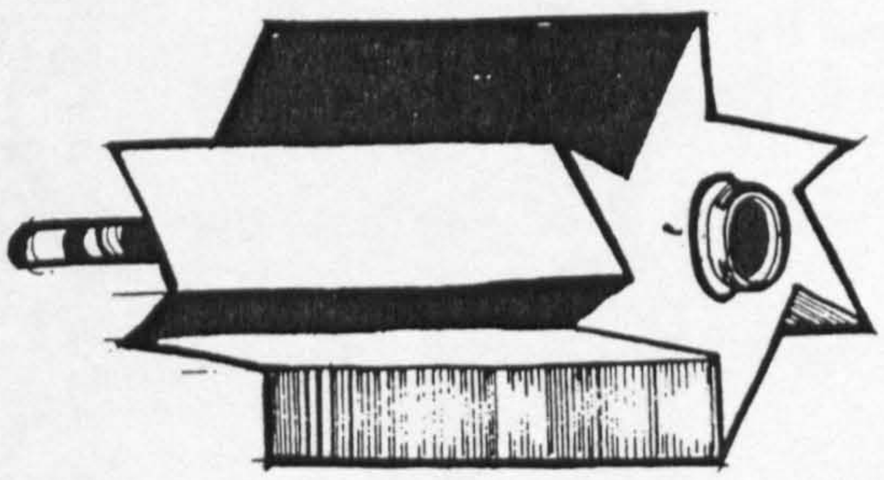
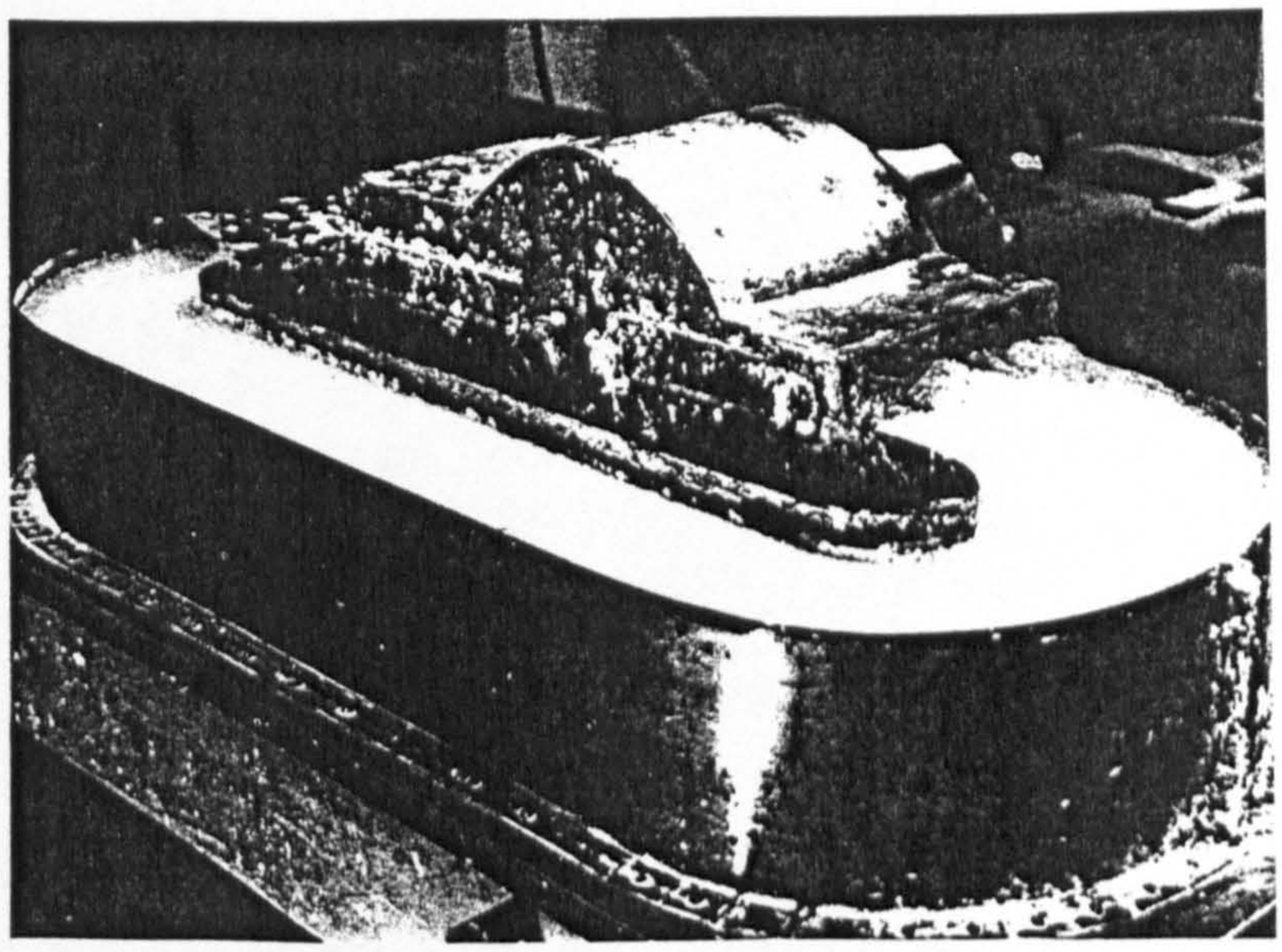


1A

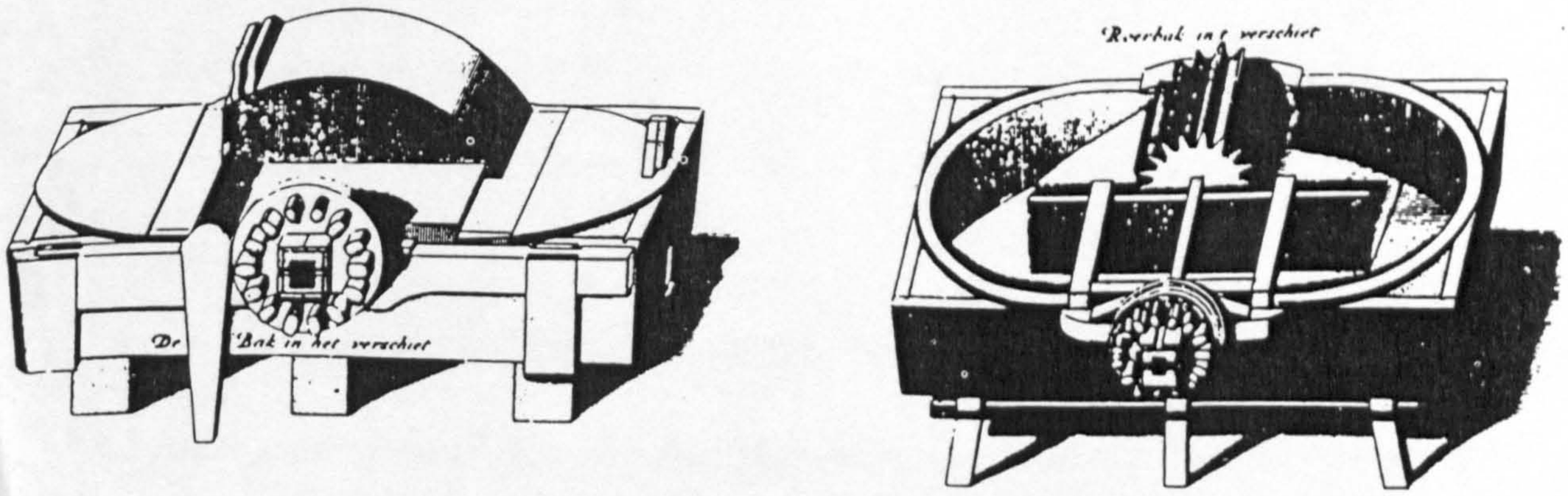
Fig. 75



The bladed cylinder used to macerate the raw fiber.



View of the beater with maceration of pulp underway. The pulp moves around the trough in a circular motion as the material passes under the blades which grind or "beat" the fiber



Early illustration of the Hollander beater showing covered and uncovered view.

Fig. 76

The Hollander is a piece of equipment that has changed little since its initial conception and is still used by handmade papermakers today. Whatman's adoption of it proved invaluable in the production of smooth paper.

Just as crucial was the sizing of the paper to prevent it absorbing ink or paint. The process of gelatine sizing was an innovation of the Italian Fabrinese papermakers in the thirteenth century. They found that the off-cuts of leather and vellum from the local tanneries, when boiled in water, yielded a glue-like gelatinous solution. The solution, as a general rule, was diluted 1 part to 10 water and a small amount of Potash Alum added to help fix it into the paper. The paper was then lowered into a tub of the hot solution, removed, then hung up to dry. This not only solved the problem of absorbency, it imparted strength to the sheet.

Whatman, like other papermakers, successfully incorporated this process into their own practice. A box of unsized paper in Whatman's mill was lowered into a large tub of hot size for one hour until fully saturated. Then it was taken out and placed as a wad of sheets under a large screw press – rather like a bookbinder's press – pressed for a few minutes, then the sheets parted before they stuck together and allowed to dry very, very slowly.

When the elder Whatman died in 1759, his son James Whatman Junior continued his pursuit of excellence. The American papermaker Joshua Gilpin recorded,

> Salmon informs me that Whatman for his best paper has double shutters and curtains inside the drying loft and will admit no air while it is drying, letting it dry very slowly. Hardens the paper by hanging it in the saule or close store room.[10]

During the early 1790s Whatman Junior conducted considerable experiments with

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[10] Cited by Bower (1990:50).

various methods of chlorine bleaching rags destined for paper pulp. He proved far-sighted, as we shall see in a later section, when he told Gilpin that "he did not think highly of bleaching. Thinks there is a waste of rags in the process [and] that it does not take the size well".[11]

Whatman Junior may have been running a business but, like his father, and his protégé, he did not seek the lines of least resistance in order to prosper. In 1794 he sold Turkey Mill to his protégé William Balston who in turn took on two brothers, Finch and Thomas Robert Hollingworth. After 1805 the partnership dissolved; the Hollingsworth's remained at Turkey Mill whilst Balston set up a new mill at Springfield, Maidstone. Each had the right to watermark their papers J Whatman Turkey Mill and J Whatman respectively; both produced papers of subtle difference and continued to co-operate, helping each other out in times of rag shortage, etc.

Balston continued to improve his craft and a crucial addition to his newly opened mill in 1806 was Joseph Bramah's hydraulic press (invented 1795) (fig. 77). It was less labour intensive and time consuming than the earlier Samson Captan presses and enabled more sheets to be pressed in one go. Furthermore, complex pressing sequences could be achieved in a search for better finishes. As Bower states,

> The changes in pressing techniques had a considerable effect on the actual surface strength of the sheet. After wet pressing, linen has a much higher relative surface strength when it is a thin sheet than when it is thicker. Some of the lightweight writings that Turner used for many watercolours show just this kind of characteristic. A cotton rag or cotton linter based sheet of the same weight and bulk would quite literally not be able to take the kind of vigorous and often many layered working that he subjected them to. This increase in surface strength and the differences in the way the sheets were pressed also had an effect on the way

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[11] Bower (1999:84).

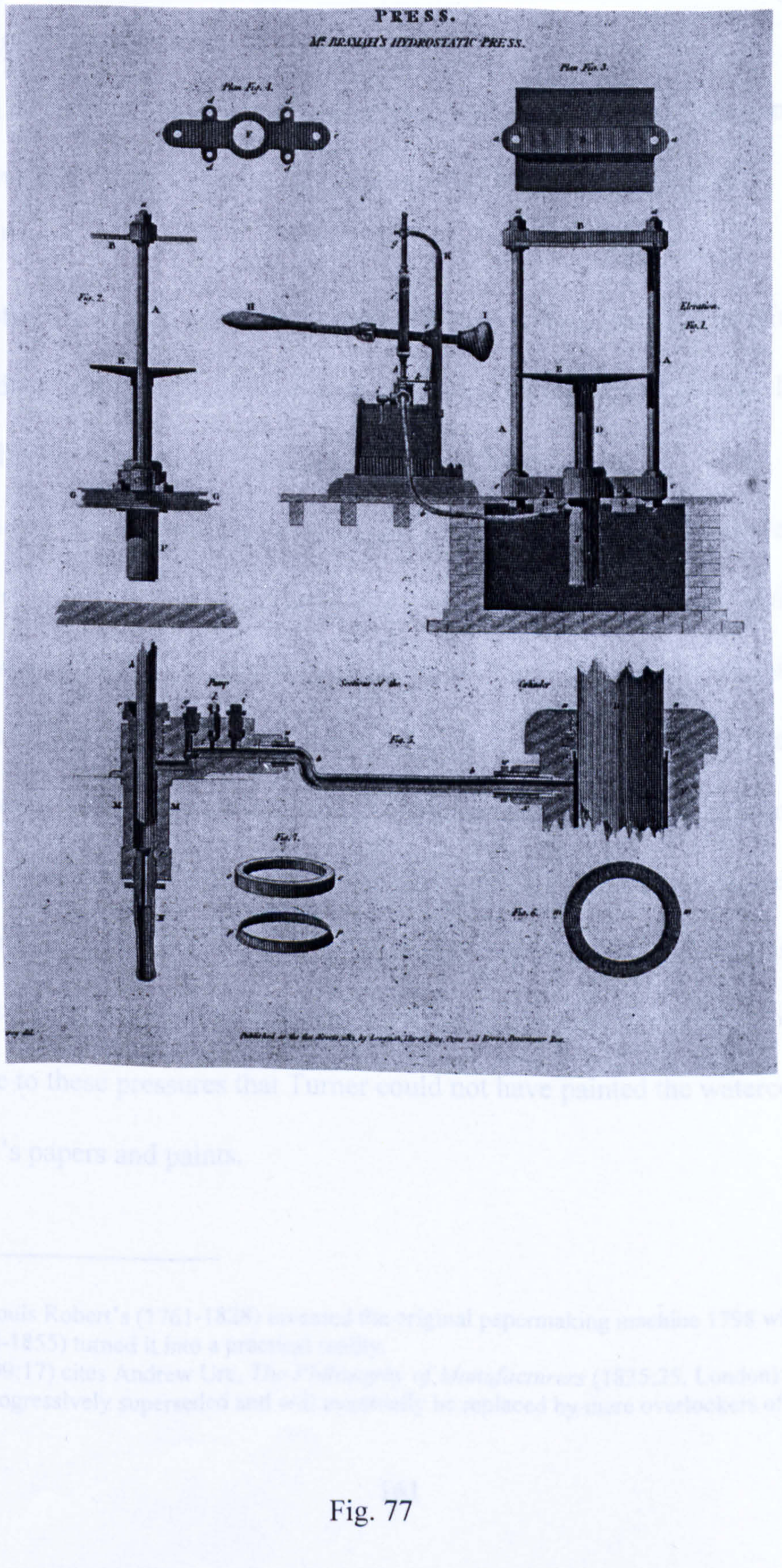
PRESS.
Mr. BRAMAH'S HYDROSTATIC PRESS.
Plan Fig. 4.
Plan Fig. 3.
Fig. 2.
Elevation.
Fig. 1.
Pump
Section of the
Cylinder
Fig. 5.
Fig. 7.
Fig. 6.

Fig. 77

> size worked on the surface of the sheet, changing the absorption of the surface, allowing coloured pigment to sit on the surface differently and more brightly.[12]

Turner consistently used Balston's papers and the benefits of the above techniques can be found in watercolours such as *Venice: The Arsenal* (1840) (fig. 78) and *The Blue Rigi* (1842) (fig. 5).

By 1857 Hollingworth's mill was relying entirely on a Fourdrinier papermaking machine (invented 1798)[13] (see fig. 79), having ceased handmade production completely.[14]

Balston viewed the Fourdrinier at Two Waters Mill in 1808 but remained unimpressed and continued to develop and specialise the handmade process. It was not until 1932 that the Springfield Mill acquired a Fourdrinier.

Although Turner used machine-made paper now and again, handmades remained his preference, confirmed by the sheet's watermark. As mechanisation gained momentum during the second half of the nineteenth and into the twentieth century, machine-made papers became increasingly bland in their surface grain and less robust for watercolour painting. Indeed, as I found with my various watercolour experiments, Whatman, like many other manufacturers, compromised the finer qualities inherent in their eighteenth and nineteenth century papers in a drive for ease and speed of production, cost effectiveness and maximum profitability – marketing concerns above those of the user. It is partly due to these pressures that Turner could not have painted the watercolours he did using today's papers and paints.

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[12] Ibid. (p29).
[13] Nicholas-Louis Robert's (1761-1828) invented the original papermaking machine 1798 whilst Bryan Donkin (1768-1855) turned it into a practical reality.
[14] Bower (1999:17) cites Andrew Ure, *The Philosophy of Manufacturers* (1835:25, London): "Skilled labour gets progressively superseded and will eventually be replaced by mere overlookers of machines...".

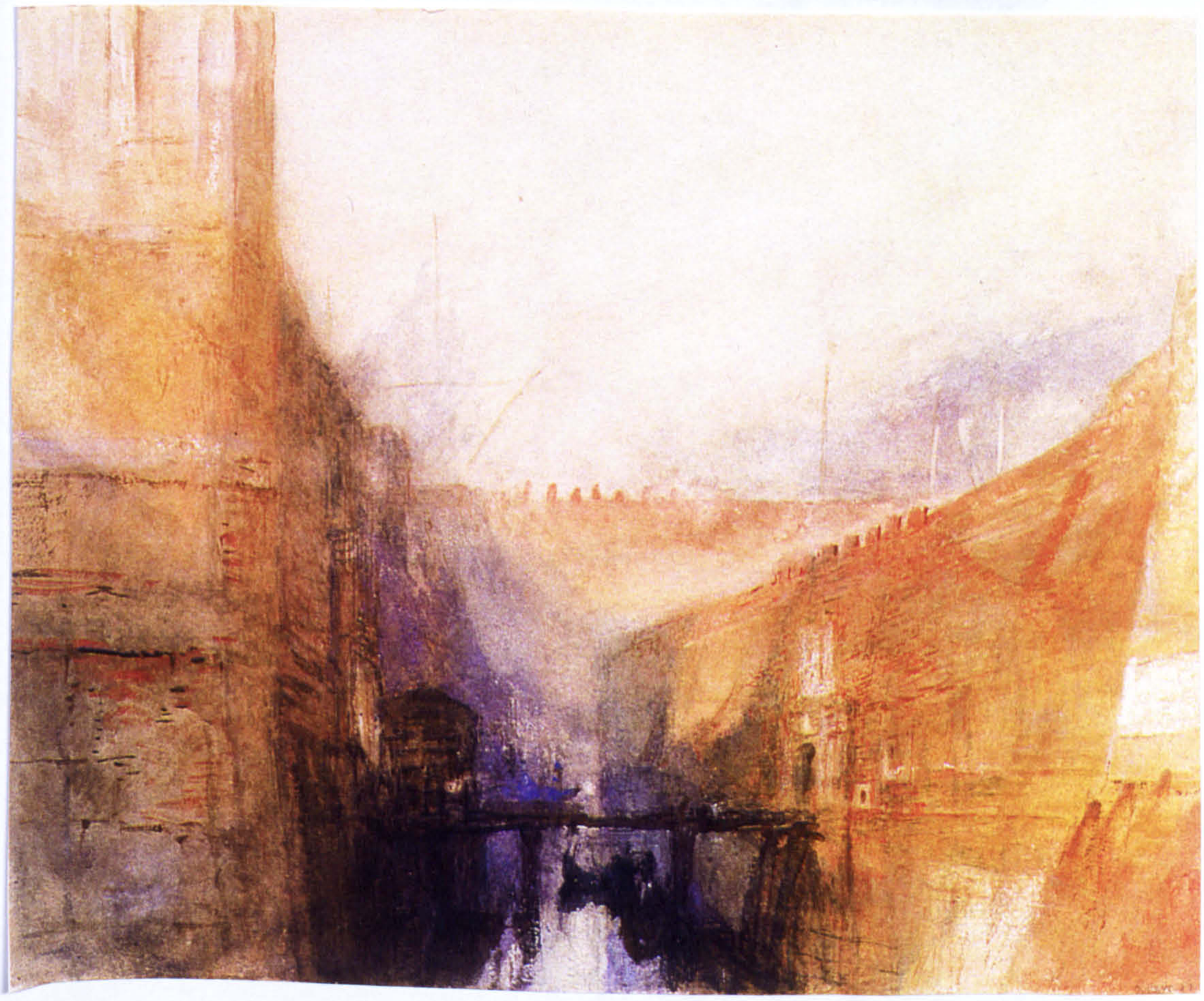

Fig. 78

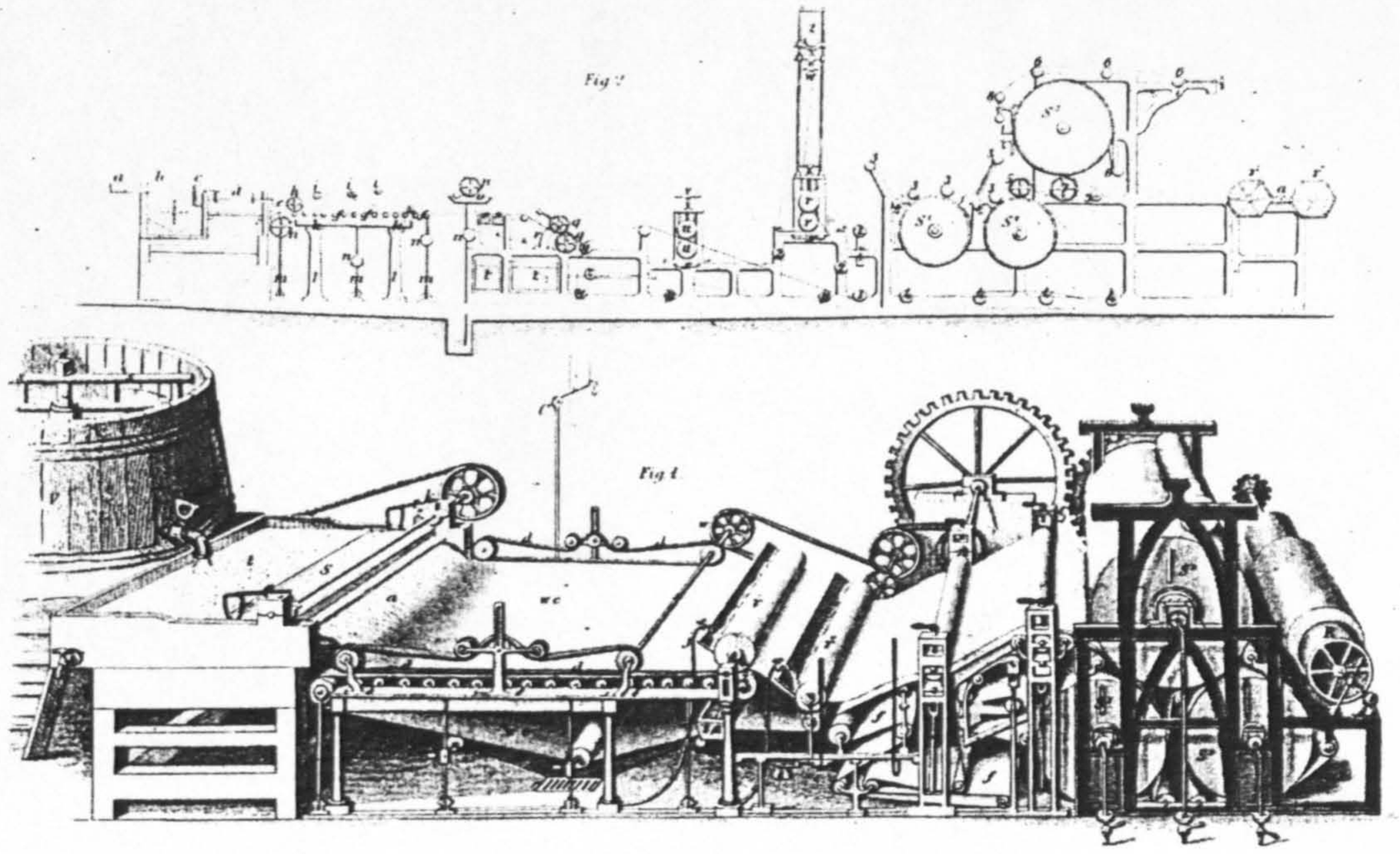

fig 20. Papermaking Machine, Steel Engraving, showing two different types of machine. The pulp is transferred from the vat 'V' onto the sluice, under a slice 't' which distributes the pulp evenly onto the wire cover 'wc'. The newly formed sheet passes through a set of press rolls and then through steam heated drying cylinders 'S' before being reeled up 'R'. This illustration must date from after 1820 and Thomas Crompton's invention of the drying cylinder. Until that date all machine-made paper was dried like hand-made paper in lofts.

This is not merely a question of obsolescence – or the manufacturers would not refer so glowingly to their past excellences – but highlights a serious problem inherent in purely financial and commercial considerations.

Both are apt to drift further and further away from the initial spirit and operative concerns of those who produced the excellencies in the first place (i.e. James Whatman, Whatman Junior and Balston), whilst this thesis attempts to show in the following section "Making Paper Like Turner's" that another solution can be found therein.

John Gerard, papermaker

In September 1989 Maureen Richardson (involved in handmade papermaking, Hereford, England) sent me the address of a papermaker, John Gerard, Berlin, Germany. I wrote to Gerard about the possibility of his attempting to emulate an 1820s Whatman paper, or indeed the best characteristics inherent in the papers Turner used. He agreed to invest time in such a project and to begin experimentation. Bower was also willing to provide recommendations based on:-

(i) his own experience of papermaking;

(ii) empirical knowledge gathered from other papermakers, some who still recalled the handmade processes and secrets passed by word of mouth from generation to generation in mills such as Whatman and Barcham Green and so on;

(iii) the historical and technical research he has done.

Gerard was provided with:-

(i) a sample of 1824 Whatman paper, in order that he may compare it with the papers he made;

(ii) the following books: Bower's *Turner Papers 1787-1820* (1990) which outlines the salient characteristics inherent in the papers Turner selected; John Gage's *JMW Turner A Wonderful Range of Mind* (1987) which contains illustrations and close-up details of Turner watercolours painted on such papers (see fig. 4);

(iii) the raw materials needed to make the paper including batches of old and worn linen rags (approx. 3-5 kg) gathered from markets, rinsed of soap and dirt; parchment and later vellum cuttings to make size – a process I would take on myself as the project developed. Gerard on average produced one batch (approx. 40-60 sheets) of paper a year;

(iv) watercolour paintings and performance analysis on each batch produced.

As the project developed, the input of an Electron Scanning Microscope (ESM) proved to be an invaluable contribution.

The uses of advanced technology – the Electron Scanning Microscope (ESM)

The ESM is a piece of advanced technology equipment which enables the testing, measuring and quantification of materials to obtain their characterisation. Once measured, their material limits can be known.

A sample, in this instance paper, is glued onto an aluminium stub, placed into a vacuum unit and coated with a gold and palladium alloy. It is then inserted into the ESM.

John Gerard's Handmade Linen rag based paper 1997

A scroll enables the operator via a TV monitor to scan the surface, magnify and penetrate into its inner structure.

The ESM photographs

In 1993, 1996 and 1998, Gerard received ESM photographs illustrating the internal fibres and structure of the following papers. All are arranged in columns of magnification starting at the top x40 and moving downwards x100, x200, x400 for ease of comparison.

No's 1-4	Whatman 1824 (William Balston) white wove paper
5-8	Bally Ellen and Steart 1820s white wove paper
9-12	Bally Ellen and Steart 1832 flecked blue wove paper
13-16	Whatman 1990s white wove watercolour paper
17-20	Arches 1980s white wove watercolour paper
21-24	Gerard's first batch of paper made for this project (1990)
25-28	Gerard's sixth batch of paper (1996)
29-32	Gerard's seventh batch of paper (1998) and most successful to date

The above photographs:

i) help explain how a reversal in papermaking technology had taken place from Turner's era to today;

ii) provide further information about the method of manufacture of papers made during Turner's era;

iii) identify progress made and problems that needed to be addressed in the replicant papers;

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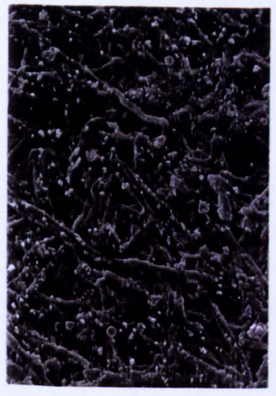
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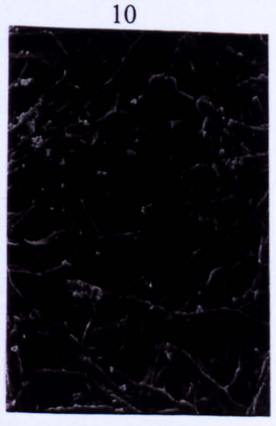
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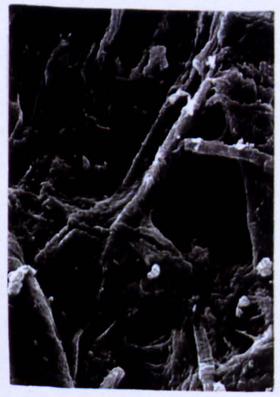
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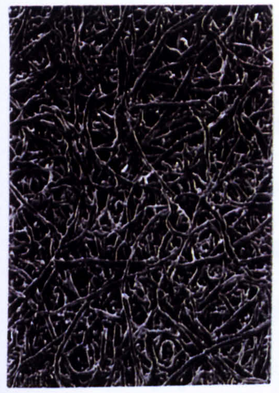
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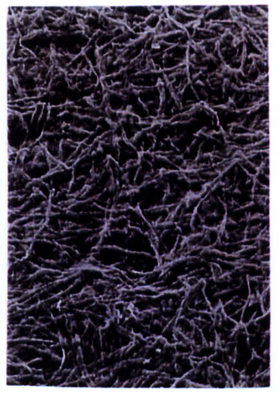
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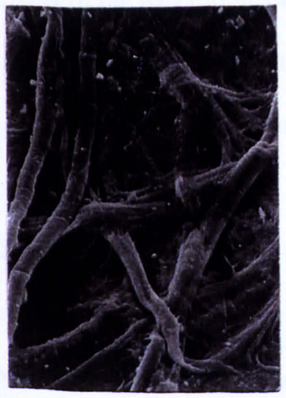
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iv) the 1820s and 1830s samples have a more compact, crushed finer fibre structure than the modern commercial grades;

v) Gerard's batches 1-6 (no's 21-28) show a gradual progression and improvement had taken place when attempting to replicate the best in the nineteenth century papers.

Research outlined in my MLitt thesis *Could Turner Paint a Turner Watercolour Today?* (1997) opened up the field and helped identify the salient problems which I have attempted to address herein; chiefly:

i) the improvements needed in forming and finishing the sheet in order to match as closely as possible the best in the papers Turner used;

ii) the removal of bleach and optical brightening agents (OBAs) from linen destined for papermaking pulp;

iii) making the sizing of the paper more effective;

iv) researching the components of the watercolour paints Turner used – their gum binders and pigments I would find contain as many secrets as the papers he selected;

v) replicating Turner's paper, paints and techniques matched with his working philosophy and practice will crucially enable a definitive understanding of how he became so prolific and inventive in the watercolour medium.

Making paper like Turner's

To attempt to replicate a linen rag-based handmade paper from Turner's era in the late twentieth century is a complex and difficult matter. The following will help the

reader understand the terminology contained in Gerard's letter summarising this project at the end of the section. Herein are the problems we encountered, the solutions we arrived at, guided by trial and error and past and present knowledge and technology. We will now look at each process in turn.[15]

I The choice of rags – why linen, as opposed to cotton?7

II The problem of contaminants, bleach and Optical Brightening Agents (OBAs): An experiment with their removal

III Preparing the rags for paper pulp – the importance of clean water

IV The beating process

V Forming the sheet

VI Couching

VII Wet pressing

VIII Exchanging

IX Drying the paper

X Glazing and finishing

XI Sizing – how sizing becomes effective – maturing paper

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[15] The handmade papermaking process has changed little in many ways since 105 AD in China, where Tsai Lun, a Chinese court official for Emperor Ho Ti, is credited with its invention. Lun made his paper from silk rags using a pestle and mortar to break down the rag fibre into pulp.

It spread westwards via a battle at Samarkand, 751 AD, where Chinese soldiers with papermaking knowledge were captured by Persians. The westward momentum continued into Europe via the Crusaders from the eleventh century onwards. John Tate's Sele Mill near Hereford, 1476, is believed to be one, if not the first, paper mill in Britain. For a fuller account of the history of papermaking, see: D Hunter, *Papermaking: The History and Technique of an Ancient Craft* (1978, Dover); RH Clapperton, *Paper, An Historical Account of its Making from the Earliest Times down to the Present Day* (1934, Oxford); RL Hills, *Papermaking in Britain 1488-1988* (1988, Athlone Press); John Krill, *English Artists Paper: Renaissance to Regency* (1987).

I The choice of rags – Why linen as opposed to cotton?

The first stage in the handmade papermaking process begins with the gathering of rags or other material destined for pulp. Since the invention of papermaking, many materials have been used for this purpose, including silk, manila, jute, linen, cotton – introduced in the late eighteenth century – and wood pulp in the nineteenth century. During Turner's era, linen remained the first choice for making the finest paper for the following reasons, although old rope, hemp and canvas sail were also used and often blended with linen.

Linen fibre is harder, longer and thicker than cotton. When beaten to a pulp, its fibres splinter (fibrillate) more easily than the latter. During the forming and closing of the sheet, the fibrils interlock with each other to help produce a harder, stronger paper.

The most suitable linen rags are those which have passed through human hands, preferably for many years. Old well worn sheets, napery and so on break down more easily during pulping and accept watercolour better – the fibres having gained an affinity for water after years of washing. New linen is deemed too hard and crisp, obviously lacking the above characteristics, but may be added as seen fit, approximately 15-20% to impart crispness. Rags are sorted into the whitest, cream-coloured or off-white and employed singularly or blended. Boiling the linen for between half an hour to an hour helps free it from dirt, soap and grease, whilst drying it in the sunshine will bleach and lighten it naturally.

George Steart of Bally Ellen and Steart papermakers, like Whatman, made so many of the papers Turner favoured; he succinctly outlines the advantages of linen to cotton in the following, written around 1819:

> A fourth great defect is that the far greater part of the drawing and writing papers now in use in this country are of a hollow or spongy texture: this arises from their being made of an indiscriminate mixture of linen and cotton, the greater elasticity of this latter preventing its fibres from closely uniting with those of the flax: the consequence is, an irregular surface and a porous spongy substance, very different from that which an adherence to the good old-fashioned practice of using fine linen rags only in the manufacture of superior papers would produce. Another serious evil is that some manufacturers having recourse to the aid of chemistry for bleaching or whitening rags of very inferior quality, by means of the oxymuriate of lime (source of chlorine), supply a drawing-paper sufficiently fair to the eye, but which, as it retains a part of the muriatic acid, speedily destroys the fine and delicate tints laid upon it.[16]

Many conscientious papermakers responded to these concerns and took pains to stress the purity of their paper by inserting 'Unbleached' into their watermark, i.e. 'Unbleached Arnold' or 'T Edmond's Unbleached'. Fortunately the vast majority of the papers Turner selected did not suffer from the injurious effects of bleaching as the watercolours he left us testify; he could tell the difference between a good and a bad sheet.

Having absorbed the above, it is no surprise that the critic and champion of Turner, John Ruskin, in one of his Manchester lectures, advocated that the Government should undertake the manufacture of a perfectly pure paper made from linen rags of the highest possible quality and should stamp each sheet so made.[17]

II The problem of contaminants, bleach and optical brightening agents (OBAs): An experiment with their removal

In the late twentieth century Ruskin's idea of a pure linen rag paper available on

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[16] Steart's letter to The Royal Society for the Encouragement of Arts Manufacturers and Commerce for the submission of a new method of forming an artists watercolour can be found in Bower (1999:89-101). Author's own words in brackets.
[17] Michael Goodwin, *Artist and Colourman* (1966:33, Reeves and Son Ltd).

demand still had not materialised. Indeed, finding old, worn linen rags which have been repeatedly washed yet crucially remain free from bleach or OBAs is exceedingly difficult. It is a problem which has defeated many handmade papermakers who choose to pulp cotton or other materials instead.

Contaminants such as blue dyes may be detected by the eye alone but OBAs remain invisible until placed beneath ultraviolet light, whereby they fluoresce brilliantly. To compound matters, in order for OBAs to be effective – i.e. to give the impression of bright, clean material – detergent manufacturers such as Lever Brothers and Proctor and Gamble design them to penetrate deeply into the fibre on both a micro, molecular and macro, surface level. To date no one has discovered a method for their removal.

Faced with the above problems, with all the light-altering and corrosive properties OBAs impart into material destined for paper pulp, I experimented with various methods whereby the white fluorescent dye (OBAs) could be removed whilst leaving the fibre intact.

At Sunderland University, Materials Science department, supervised by John Smith (Technician), we placed two pieces of 5 cm square OBA linen into a beaker of Acetone for one hour, believing it may help loosen their structure. The samples were then placed into a sonic bath and bombarded with ultrasonic waves for two hours, again hoping it may disperse or at least loosen up the OBAs. However on removal, the linen still fluoresced brightly and the material corroded slightly.

Dr Alistair Charles (Newcastle University, Analytical Surfaces) suggested simply leaving the linen under a large laboratory ultraviolet lamp; since ultraviolet ages and

degrades, it may have an effect on the OBAs. This was done for four hours, six hours, then eight hours, but with no effect.

Another attempt involved steeping OBA linen in a bucket of water for one month, changing the water two or three times daily, scrubbing and rinsing, hoping friction may help free the contaminant. The same material was subjected to a mild soap and a citric acid (lemon juice), repeatedly rinsed and dried in sunlight to bleach it naturally. The linen still fluoresced.

The most practical solution I have found to date is to use a pocket ultraviolet lamp to test the linen at source whilst gathering it at markets and so on. Though painstakingly slow, enough OBA-free linen was found (approximately 5 kg) to make a batch of around 70 sheets of paper.

III Preparing rags for paper pulp – The importance of clean water

Once suitable rags are found, they are cut up into 1-2 inch squares and cooked in clean, boiling water. This not only removes dirt and grease from the fibres but softens it so that it breaks down more easily during the beating process. During the preliminary experiments in this project, clogging of the Hollander beater became a major problem. This process helped to solve it. Cooking time can vary – 2-3 hours is generally sufficient, tougher rag fibre may take up to 8 hours or longer; a double boiler or pressure cooker may be employed but care must be taken not to overcook, i.e. damage the fibres, more than necessary.

If clean, pure water is used at this stage and during beating and sizing, it will prevent difficulties throughout the entire process. Any pollutants or impurities such as

chlorine, traces of iron or rust will affect the clarity of the paper – the latter problem prevented with a filter.

It is worth noting that the pH value of water varies from 4.2 to 7.8 (0 being very acidic, 14 pH very alkaline); 7 pH strikes a balance to produce an acid chlorine-free paper that will not yellow or become brittle.

IV The beating process

A papermaker's truism is that, 'Paper is made in the beater'[18], for if the rags are not beaten satisfactorily then problems will inevitably occur in the following stages:

As mentioned earlier, rags are beaten to pulp in a piece of machinery called the Hollander which has changed little since its invention in seventeenth century Holland. It is a large tub (see fig. 76) at one side of which is attached a metal roller with blades.

Directly under this roller is the stone or bed plate. During Turner's era, they were steam driven; today they are electrically powered.

The linen rags, already cut into 1-2 inch squares, are added gradually into the tub of hot water. The rags and water circulate between the roll and bed plate where they are lacerated by the roller's blades. The pulp is kept in constant circulation by the impetus caused by the backfall and rotation of the roll. When macerated, the fibres gradually split from the parent fibres, as they are sliced, diced and beaten into fibrils (like branches of a tree). It is the fibrils' branches which interlock when the papermaker shakes the mould and presses the sheet.

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[18] Bower (1990:36).

The distance between the roller and bedplate may be adjusted to create a smaller or larger channel through which the pulp passes to be lacerated. This can be done by increasing the number of bedplates. Thus the papermaker controls the character of the paper by affecting the length of time the pulp is beaten, and its consistency by adding more or less water. Care must be taken that the pulp is not over-beaten as this will increase the risk of cockling – the curling and warping of the sheet when it is drying.

The papermaker tests the consistency of the pulp which is a slimy, gelatinous mass either by feeling it by hand or diluting a little in a jar of water and noting the tendency of the fibres to clot or gather. Generally a fast beating time carried out at high speed (- the roller can rotate at 230rpm -), whereby little time is allowed to develop a hydrated pulp cellulose, will produce a soft, limp paper. Gerard's early attempts at matching the best in Whatman and other papers Turner used were beset with softness, absorbency and large grains in the surface texture.

These problems are vividly illustrated when comparing the ESM samples of 1820s Whatman and Bally Ellen and Steart papers (nos. 1-12) with Gerard's first batch (1990) (nos. 21-24) and his sixth batch (nos. 25-28). The 1820s samples show much more crushed, compact fibres when compared to Gerard's early attempts or indeed modern Whatman and Arches machine-made papers (nos. 13-20). The dark gaps between the fibres indicated open, porous and therefore absorbent areas. Progress was made from Gerard's first batch to the sixth, however some crucial differences still remained.

These differences were resolved in the beating process more than anything else, whilst lumps and clumps in the sheet and surface texture were eliminated by employing a

Knotter, a sieve-like device which filters lumps out of the pulp before it is placed into the vat (a device introduced circa 1819).

After much experimentation, a beating time of between 6½ to 8 hours was found to be highly effective, with the roller placed all the way down for four hours, the first half-hour allowed for maceration of the rags, the last two hours slightly up, to brush the fibre. This produced a milky-smooth pulp for the seventh batch (1997) (nos. 29-32) – a consistency crucial for the following process.

V Forming the sheet (see fig. 80)

Once the pulp has reached the desired consistency, it is poured into the vat. The papermaker or vatman takes hold of the deckle, which looks like a picture frame, and places it on top of the mould (see fig. 81). The deckle prevents pulp escaping at the edges, though the little which does slip between the deckle and mould forms an irregular edge – the deckle edge, a hallmark of handmade paper.

The papermaker or vatman's skills involves dipping the mould into the suspended pulp and gathering more than is needed to cover its surface. Lifting the mould out of the pulp, he deftly shakes it away from him, throwing the excess pulp off to the far side in a wave-like motion. The mould is then shaken sideways to close the sheet by interlocking the fibres.

This skill involves immense discipline, often only acquired after years of practice, until the 'stroke' and 'feel' becomes second nature. It also requires an intuitive sense of weight to maintain an even depth in the sheets throughout the batch.

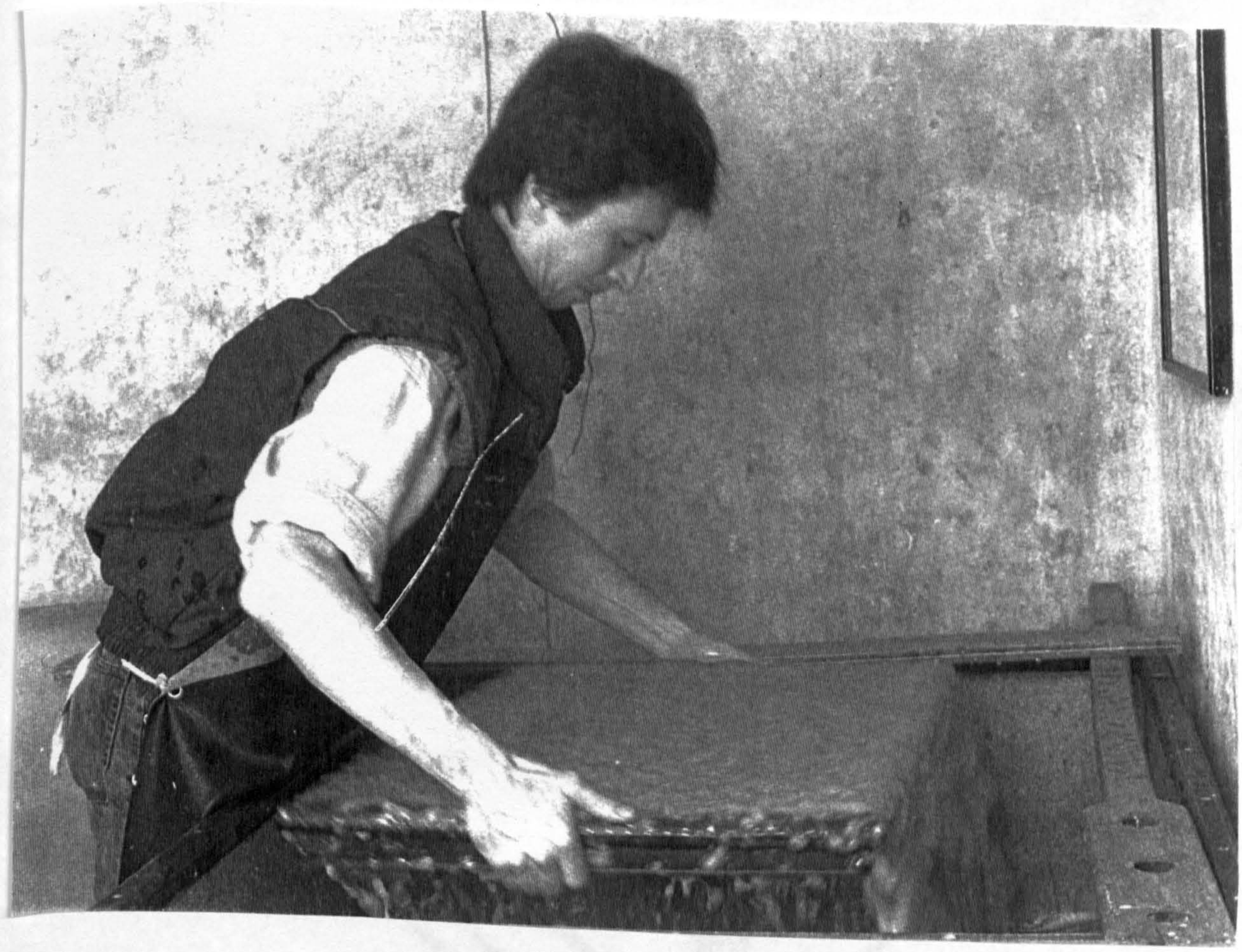
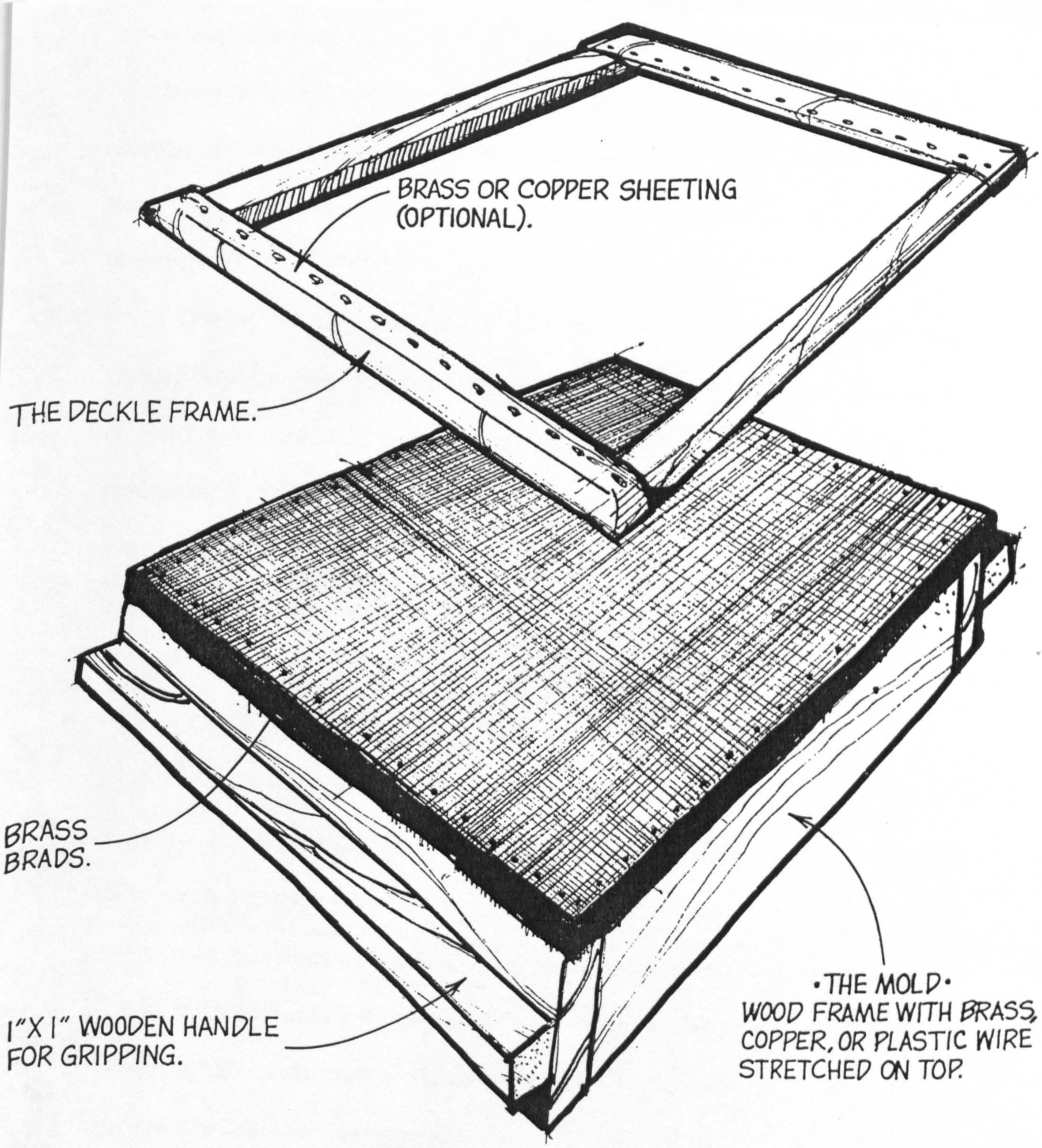


Fig. 80



The fabric or wire wove screen fitted over the frame. On top of this is placed the deckle.

Fig. 81

The four-way shake creates a multifarious surface texture as the suspended fibres darting in all directions are solidified in an instant. Such a surface helped Turner produce his atmospheric effects, among other techniques described in Chapters V and VIII, as the interplay between the paint film and the minute interstices of light and shade between the fibres create a ready-made stippled tint. It is a characteristic missing from bland machine made papers.

Dipping took Gerard 45 seconds (approximately) and an additional minute of draining before the sheet could be safely couched (see below). There were concerns about the slowness of the dip and drainage time, feeling it compromised a smooth continuity in production. A cold vat permits almost no drainage, thus the vat must be kept warm or even hot to facilitate it. Using two moulds, one after the other whilst the former is draining, is a solution of sorts.

VI Couching (see fig. 82)

Once the wet sheet has sufficiently solidified upon the mould – a stage marked by a distinctive lustre over its surface – and the excess water drained off, the mould is gently rolled across a felt on a solid flat base, without stopping. Immense care must be taken to prevent the sheet creasing or tearing. When completed, another felt is laid on top and the process is repeated until a pile is formed. Woollen felts are the most suitable - a synthetic blanket will give a mechanical surface to the paper - for the texture of the material is imprinted into the sheet during pressing.

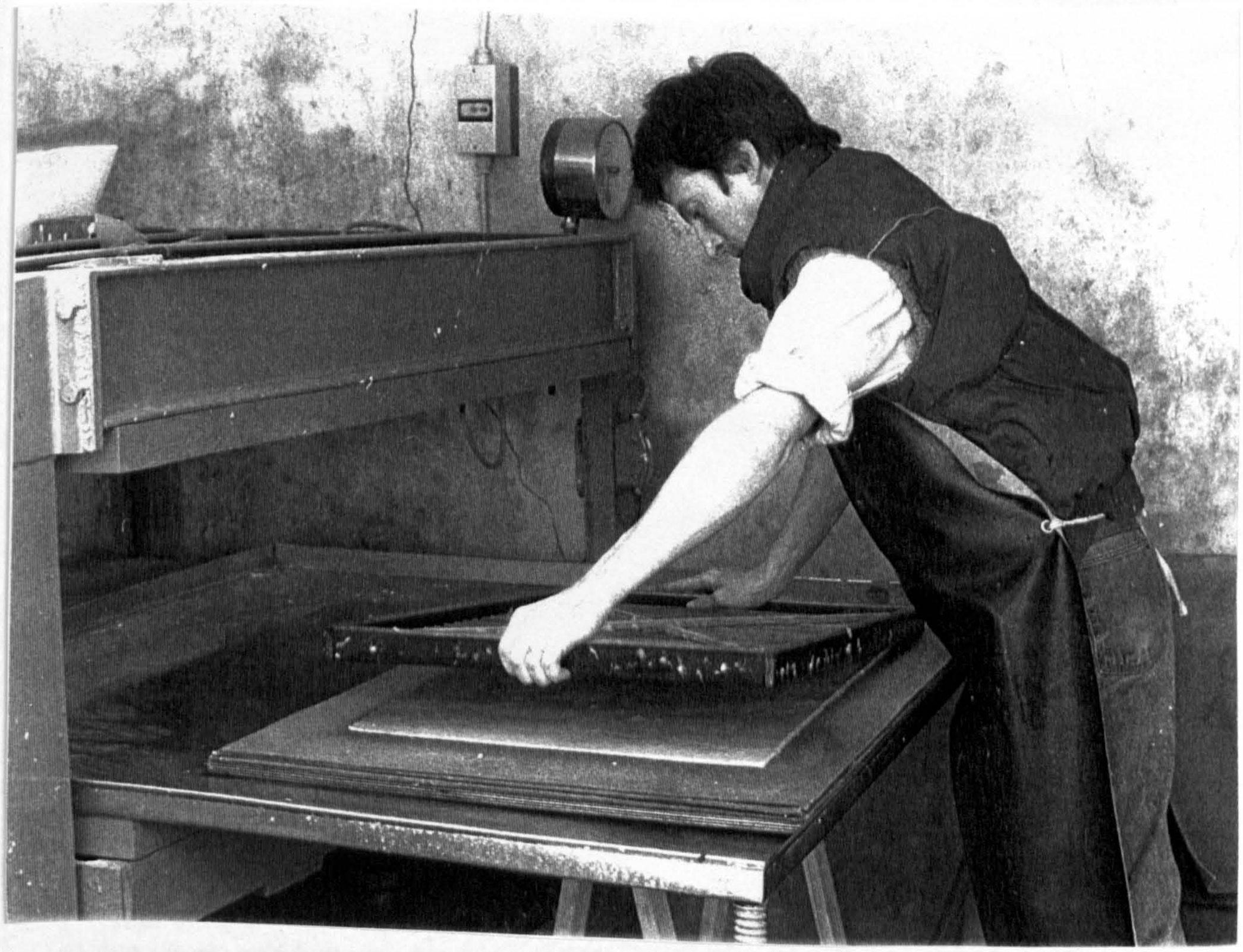


Fig. 82

VII Wet pressing (see fig. 83)

The pile of papers and felts receives its initial pressing. This may be done with as much pressure as possible to squeeze out any remaining water and impart stability to the sheet. Gerard's press could exert 2 to 3 tons per square inch, more than adequate. Bower crucially noted, "After wet pressing linen has a much higher relative surface strength when it is a thin sheet than when it is thicker".[19] This is evident in many of the thin, lightweight papers Turner selected which could still be worked with immense complexity as *The Dark Rigi* 1842 (fig. 2) shows. Gerard wet-pressed the seventh batch three times.

VIII Exchanging

It is advisable to lay the sheets for a second, third or fourth pressing with no interleaving felts; gentle enough to make the sides of the post (i.e. pile of paper) weep. This may be repeated until the paper's surface acquires the desired finish. Exchanging and pressing the sheets in this manner further stabilises its random surface texture.

IX Drying the paper (see fig. 84)

After exchanging, the sheets are taken in packs of between 5 and 8 sheets (also called spurs) and hung to dry on ropes like washing. The first or top sheets are allowed to become bone dry which promotes more creasing and cockling in the final sheets. Once completely dry, the sheets are parted, re-stacked and pressed. Severely warped and cockled sheets are re-moistened between damp felts and pressed again.

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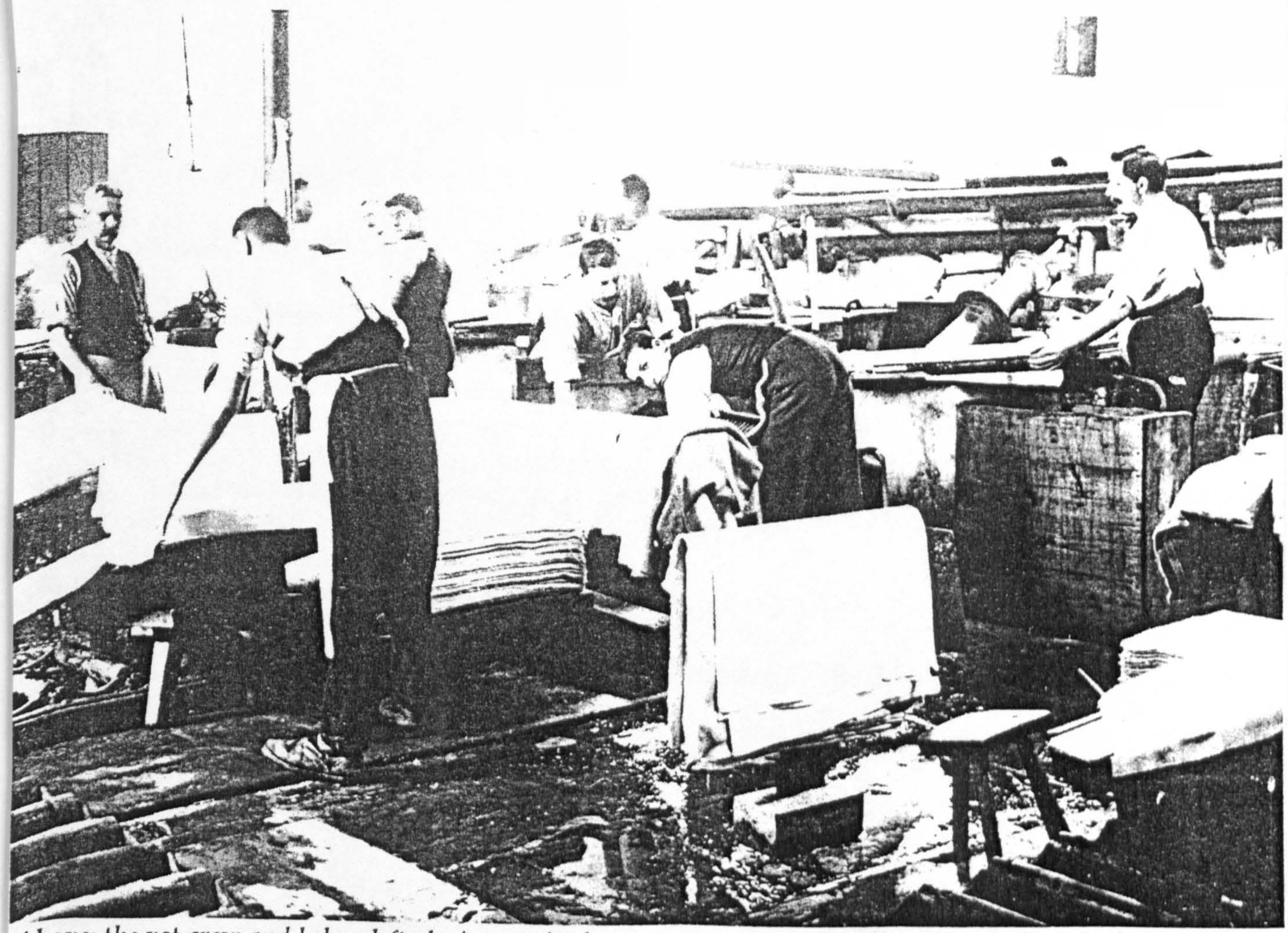
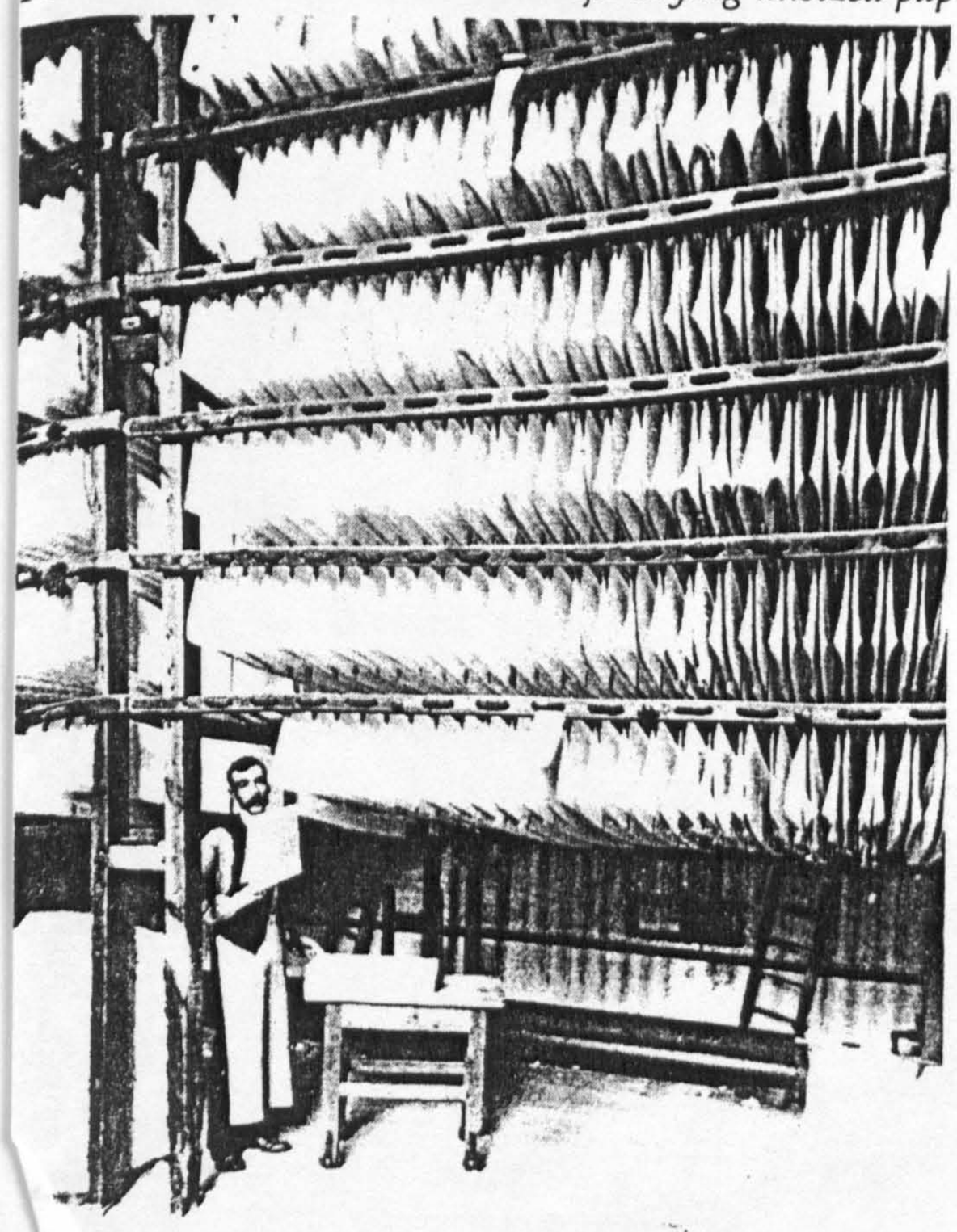
[19] Bower (1999:29).

Fig. 83



Above: the vat crew and below left: drying unsized paper over ropes and, below right, drying sized paper flat



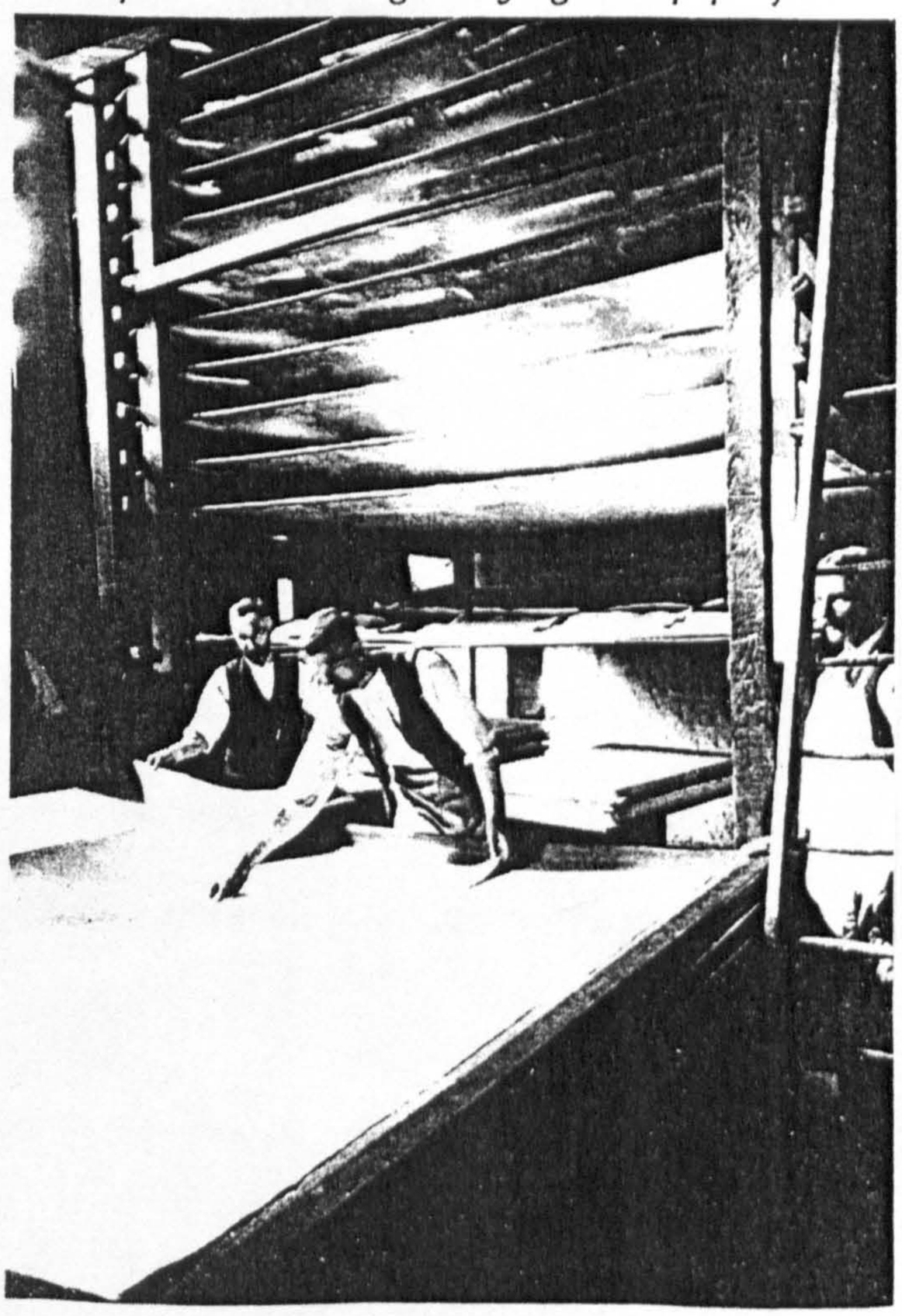


Fig. 84

A viable alternative is to dry the paper in the above manner but laying it flat on screens. Some papermakers choose to sandwich the paper between blotters but this can destroy its surface texture. As Bower advised:

> The secret of watercolour papers is very long drying times (well, one of the secrets). I would be happiest if the paper could take up to two weeks to dry. I would use no heat and minimum air flow. To allow all the tensions in the sheet to resolve right out to the edges without undue cockling (wrinkling of the paper as it shrinks – usually a product of drying too fast).[20]

Gerard dried the paper when it was cold during a freezing autumnal atmosphere.

The above echoed Whatman's uncompromising slow-drying methods outlined in an earlier section.

X Glazing

Glazing is the term used to describe the method whereby paper is given a degree of smoothness or polish to its surface, succinctly illustrated in fig. 85.

If a 'rough' surface is required, the paper receives only a light pressure during pressing in order to retain the textured surface of the felts.

If a 'not' surface is required – a surface that lies between rough and smooth textures – it is exchanged, re-pressed and lightly glazed in the following manner.

If a 'hot pressed' smooth surface is required then the paper is sandwiched between two metal sheets and passed through metal rolls which may be set to allow a little slippage between the plates; the press is not too dissimilar to an etching press. HP, as it is known, was introduced in England circa 1800 and, as its name implies, was achieved by pressing

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[20] Personal communication (27/9/89).

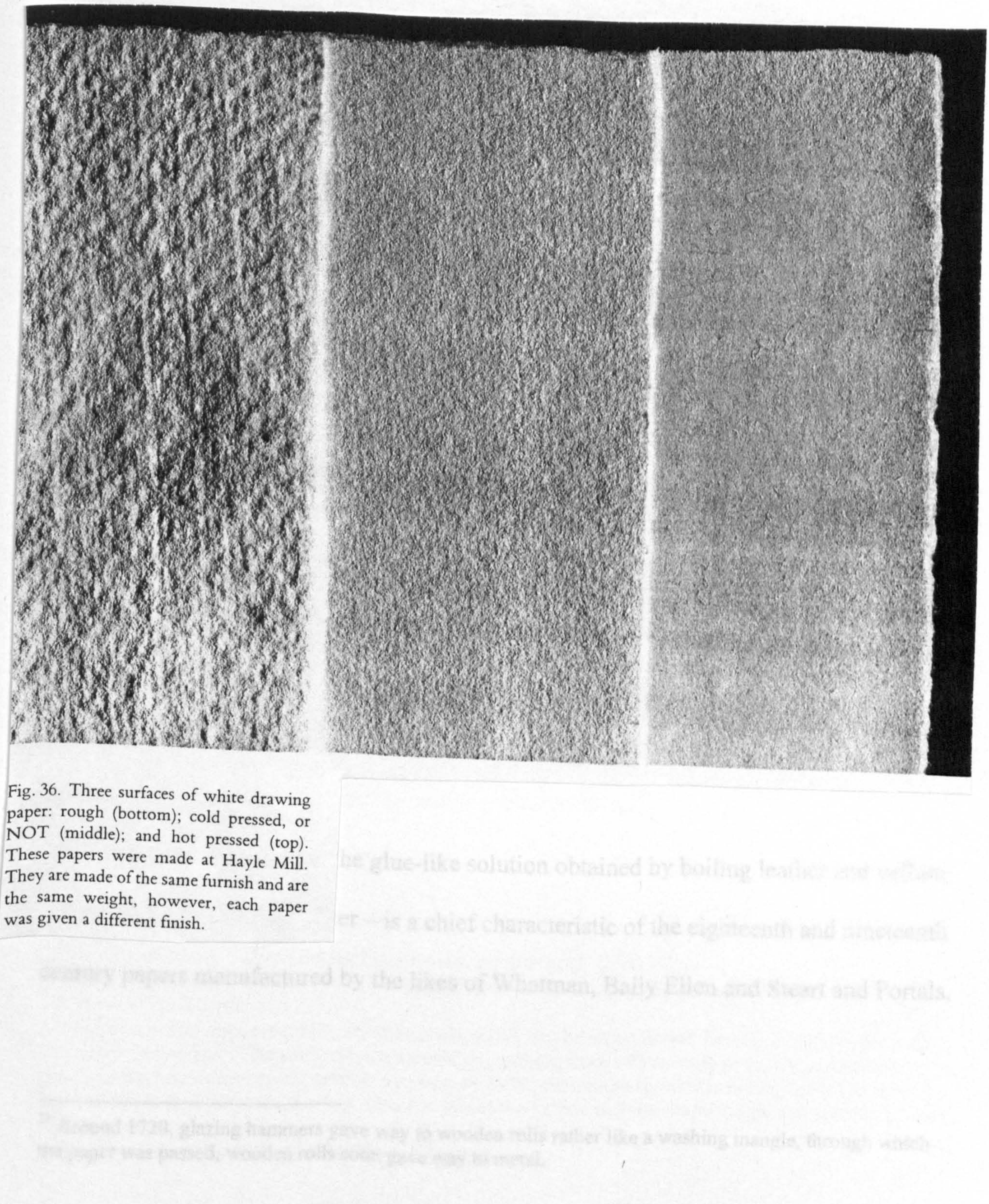

Fig. 36. Three surfaces of white drawing paper: rough (bottom); cold pressed, or NOT (middle); and hot pressed (top). These papers were made at Hayle Mill. They are made of the same furnish and are the same weight, however, each paper was given a different finish.

paper between hot metal plates but the former method will also produce much the same effect.[21]

Many of the papers Turner selected, especially those designed primarily as writing papers were HP and still retained a slight texture to their surface.

During glazing, more than one sheet of paper at a time may be sandwiched between the plates. Their textures become imprinted under pressure to produce further subtle finishes to the paper. However, care must be taken, for if too much pressure is exerted, it will create an extremely smooth surface, eradicating the textures produced in the previous processes.

Gerard employed copper plates for this process and glazed the sheets singularly and in combination, two or three sheets at a time; this was repeated a third time in order to attempt to match the nineteenth century papers.

XI Sizing – How sizing becomes effective

Before paper is sized, it is soft and absorbent like blotting paper. An ill sized sheet will absorb watercolour, producing a dull, lifeless effect to the colours. If oversized, watercolour will not spread evenly across the surface, but instead settle into globular patches.

Gelatine sizing – i.e. the glue-like solution obtained by boiling leather and vellum offcuts and diluted in hot water – is a chief characteristic of the eighteenth and nineteenth century papers manufactured by the likes of Whatman, Bally Ellen and Steart and Portals,

[21] Around 1720, glazing hammers gave way to wooden rolls rather like a washing mangle, through which the paper was passed; wooden rolls soon gave way to metal.

among others.[22] Their handmade papers designed for writing on or for watercolour painting, such as those Turner preferred to work on, were sized twice for added strength.[23] Gelatine however is difficult to maintain in optimum condition for reasons explained below and some papermakers chose to employ chemicals such as rosin/alum[24] (patented circa 1807) as a speedier alternative adding it to the pulp, though more conscientious manufacturers such as Whatman and Barcham Green adhered with gelatine until the early 1970s.

After many experiments with gelatine sizing and drying papers for this project, Gerard agreed that I would conduct further experiments on receiving the unsized paper (December 1997) since I had more time to monitor what is an extremely difficult and labour intensive process.

Paper sizing is affected by atmospherics and temperature variables; for example if the weather is too hot and dry, the size will evaporate and not take to the sheet. On the other hand, humid misty mornings assist the size to bond and dry slowly within the sheet as Jack Barcham Green noted:

> The time of year has a lot to do with good sizing. My father always told me it was a mistake to make or size Drawing papers during August, but papers made during October and November will mature quickly and size easily. This is due to the foggy mornings in the late autumn which soften the waterleaf paper in the loft after it is dried, if the louver boards are fully open.[25]

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[22] For more on sizing methods during Turner's era, see Bower (1990:31-32).
[23] Printing papers which need to retain a degree of absorbency to accept ink received one sizing.
[24] Cohn (1977:21) states:
"Rosin alum sizing employs stable, dry chemicals, which can be incorporated directly into the paper pulp, thus saving a step and in the early nineteenth century, making more efficient use of newly introduced papermaking machinery. In this method common by 1870, aluminium resinate is precipitated onto the paper fibres in the pulp stage, leaving a residue of sodium sulfate and free sulfuric acid that ultimately leads to the sheets deterioration."
[25] Barcham Green (1967:20) cited by Bower (1999:32).

The above process can be replicated artificially as we shall see in the following experiments which absorb the best of eighteenth and nineteenth century sizing practices.

Goatskin vellum was obtained[26] and cut into 10mm pieces. 62 grams of cuttings to a quarter-pint of distilled water were placed into a small enamelled metal bowl and left to soak overnight.

The bowl was made watertight with tin foil and placed inside a larger pan balanced on three pieces of ceramic which acted as a platform to raise it from the pan's base. The pan was then filled with water to approximately a third and the lid placed on top and boiled constantly for five hours. This process of double-boiling (or Bain-marie) ensures the bowl's inner contents receive a constant and even temperature throughout and crucially, since the contents cannot evaporate, nor steam penetrate the foil, a purer concentrate of size is produced.

Similar results can be obtained merely by boiling in a pan with a secure lid, the same ratio of vellum cuttings to water for three minutes initially, then bringing to a simmer for 3 to 4 hours. This method involved more monitoring (approximately every 25 minutes) to check for evaporation, remedied by topping up with water as and when appropriate. Once the size had been cooked, it was allowed to cool slightly and poured through a nylon gauze to separate any lumps from entering a large jar (a coffee jar sufficed!). This concentrated gelatine was then diluted one part to 10 hot distilled water – the jar's lid serving as a volume measurement – into a separate jar. To this mixture, a third of a teaspoon of potash alum was added in order to help the size to bite and fix into the paper's fibres.

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[26] Supplied by Russell Bookcrafts, Great North Road, Wyboston, Bedfordshire.

Three jars of hot, diluted size were poured into a large aluminium catering tray which served as a size vat. It is crucial that the size remains hot (about the same temperature as drinkable tea), not boiling, if it is to bond with the paper. A constant temperature was maintained by placing the tray on top of a cooker's burners.

The sheets of paper were placed into the size one at a time; a large brush was used to ensure the size penetrated beyond the surface into the fibres. A wad of 15 sheets was built up inside the tray, each sheet helping compress the size into its neighbour through mutual pressure. The was remained inside the tray for 15 minutes.

Holding the corner of the wad of sheets, it was taken out of the tray and the surplus size allowed to drain off.

The wad was then sandwiched between two pre-heated formica boards, as cooling the paper too quickly will chill the size and prevent it from bonding effectively. The boards were placed on the floor and subjected to the pressure of an overturned table and two adults standing on top for approximately three minutes. This mimicked the effects of a papermaker's press to a degree, helping to squeeze out any excess size and ensure its penetration into the sheets. The top board was removed and each sheet peeled from the wad one at a time and hung on overhead lines attached with two pegs to each sheet with small pieces of blotting paper in their teeth to protect the paper's edges.

To prevent the rapid cooling of the sheets, assist their slow drying and resolve the tensions in the fibres, a humid atmosphere was created in the hanging room by boiling three pans and a kettle of water for thirty minutes. The paper hung in this draught-free atmosphere for twenty-four hours.

Sixty sheets of paper in two thirty-sheet batches were sized on 4 and 8 January 1998 for the first time. One month elapsed to enable the size to set sufficiently before the paper was sized a second time on 2 and 18 February.

Maturing paper: After sizing, the paper was allowed to mature, harden and cure; a crisp, dry surface accepts watercolour better than a soft absorbent one. Size hardens considerably after three to six months and even more so after a year. The process is analogous to oil painting; as the oil paint's skin slowly dries, it produces a harder surface shell. Thus as water held in the sheet slowly evaporates with age (for a sheet can hold 16% water which in time may reduce to 9-8%), the process of chemical bonding between the paper's fibres and size takes place. It is for the above reasons Whatman, Bally Ellen and Steart, among others, would not send their artist or writing papers on to the stationers to be sold until they felt they had sufficiently matured, though obviously commercial pressures could modify such concerns.

In March 1998, the paper was taken to Newcastle University Bindery where Derek Bradford (retired Bindery manager) , Owen Bradford (manager) and myself, using an eye-glass, compared and closely examined the surface texture of Gerard's seventh batch with the 1820s Whatman and Bally Ellen and Steart papers.

Bearing in mind that variants in quality are to be expected in a handmade batch, we agreed there was little difference, if any, between the 1820s samples and Gerard's paper. Indeed in many instances the surface texture of Gerard's paper appeared more multifarious than the 1820s samples. The paper was then placed in batches of 20 sheets between millboards in a screw press to compress it for a further six months.

Further comparisons of Gerard's paper with those Turner used were made at the "Turner and the Scientists" exhibition, Clore Gallery on April 28 1998, the conclusions of which are discussed in Chapter VIII.

Conclusion

Turner's selection of handmade linen-rag-based gelatine-sized papers helped him produce his innovative watercolours at a prolific rate. Such papers were eminently useable for his vigorous watercolour techniques involving the layerings of tints upon tint, scraping, rubbing and repeated soakings of water. Since they were well made and hard sized, their surface did not break up easily and crisp sharp details painted with the point of a brush would remain sharply defined, not woolly or blurred when applied on top or between these paint films.

The manufacturers of these papers, such as the Whatmans, their protégé Balston and Steart of Bally Ellen and Steart, among many others, were unwilling to compromise the quality of their sheets even when opportunities arose to do so.

The bleaching of rags could mask inferior pulp stuff but eventually corrode the sheet and the tints painted on them; chemicals could speed up sizing but at the expense of surface strength; machines would eventually produce two thousand sheets in the time it took to make twenty handmades, but with increasingly bland and weaker characteristics; the tension between quality and mass provision increased. Turner did use machine-mades now and then but his preference, like many watercolourists, remained with the handmades.

The above papermakers pursued a conscientious empirical philosophy, absorbing innovations from different provinces and cultures both past and present. In order to survive, they became increasingly specialised and focused on the pursuit of excellence whilst others willingly acquiesced to commercial pressures – as severe then as they are now. Their determination was the artist's gain but from the 1850s onwards, as mechanisation gained momentum, the reversals in technology became the artist's loss.

That the papers and paints Turner used are unavailable today is a serious problem and one that cannot be put down to mere obsolescence, or modern manufacturers would not refer in such glowing terms to their past excellences. Researching the philosophies, materials and techniques that created these excellences in the first place and which are now absent from the mainstream has enabled me to attempt a replication of the best in the papers Turner used. The papermaker John Gerard's letter serves as a succinct summary to this chapter (see fig. 86).

It is a crucial step in the decoding and interpretation of Turner's prolific watercolour practice, since the relationship of the parts to the whole has remained largely unfathomable for over a century and a half. However the papers Turner used are but one part of the picture, though a large part at that. We will turn to look at the paints and mediums he used and his philosophy of practice which bound them to the paper.

John Gerard
The Paperstudio
Auf den Essig 3
D-53359 Rheinbach
Tel.: 0226 - 2102

12.11.97

Dear Paul,

As you heard on the telephone last weekend, I made several posts of your paper on Friday, November 7.

The pulp was prepared on the previous day, having spent one and a half hours just cutting 2.5 kilograms of your OBA free rags . White to cream colored rags were used and the resulting pulp is off white. (see sample) The pulp was beaten gradually, adding 500g of cloth cuttings about every 15 minutes to the hollander until the total amount was added. After six hours of beating, the roller was raised slightly to brush the fiber, making the total beating time eight hours. The pulp is knot-free and very smooth.

Beginning the next morning with a very hot vat, I used two moulds to make your sheets. The drainage time at the beginning of the day was noticeably shorter than at the end of the day, when the vat became increasingly colder. The drainage time remains about 90 seconds for each mould, but this time I had the feeling that is was a bit quicker than the last batch I made for you. The general making went well; for some reason there are dirt specks in several of the sheets, but this is not the rule. The sheets have been parted three times and pressed three times using as much pressure as here possible (250kg/cm²).

The sheets are now drying in spurs, hanging in a side room of our house, which is unheated and not so drafty. It is actually good that I did not make this paper a few weeks ago, when the temperatures dropped to the freezing point at night; now it is quite cold at night, but there is little frost.

I am not sure when the sheets will be dry, but they will be sent to you, unsized, next week, before I leave for America (18 Nov. to 6 Dec.)

While the pulp was beating, I reread all of your letters, and again was inspired by the excellence of this project and was thankful for all the tips and suggestions you have written over the past years; the photographs of the paper structures were also very informative to me, and I hope that with the increased pressure and additional parting, the fineness of the paper will be increased.

With best regards,

Fig. 86

Chapter VII

Making paints like Turner's

The British astronomer Arthur Stanley Eddington (1882-1944) once likened the effect of atoms to the minute touches of colour found in impressionist paintings; many a Turner watercolour would fit this analogy. Eddington discovered that the stars shine because of nuclear reactions in their interior. Soon after, he was staring at the starry evening sky with his girlfriend who commented romantically on how beautiful the shining stars are. Eddington replied, "Yes, and I'm the only man who knows why they shine", which he then proceeded to explain.[1]

Here I will explain why Turner's watercolours are luminous and brilliantly complex. Having made paper like Turner's and explained how its light scattering properties illuminated the paint films he laid down, I will now describe the constituents, gum binders and characteristics of those paint films and how they influenced what he could and could not do in the medium. This will involve making watercolour paints like Turner's and testing them out in practice.

Finding the structure of how things are made in order to understand them is not only a strand in analytical and empirical philosophy; here it has provided a key to understanding Turner's watercolour art.

The papers and paints Turner used are very different from what are available on the market today; now they may be matched, duplicated and developed with a degree of precision and confidence unobtainable before.

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[1] Arthur I Miller, *Insights of Genius, Imagery and Creativity in Science and Art* (1996:167-168).

The natural philosopher Robert Boyle (1627-1691) sought to show "the way experiments are made so that they lose their mystery".[2]

Showing how Turner's watercolours are made I believe increases, not diminishes, their mystery and may change the way people think about them into the bargain.

Turner's watercolour paintings often contain a mixture of transparent and opaque paint films and textures. Sometimes they appear to have a bright, luminous rather candy-like or, as some commentators note, pastel-like quality to them. Other areas of paint can look dull, flat, lustreless, like a slice of turnip. We can also find large or small areas of powdery gouache and bodycolour paint of various thickness and tones on top of a transparent paint mixed with it or indeed dissolved and diluted in its own right. Thus all can be found singularly or combined in watercolours such as *Norham Castle* (1823) (fig. 3), *Prudhoe Castle* (1825) (fig. 18), *Venice: the Arsenal* (circa 1840) (fig. 78), *The Dark Rigi* (1842) (fig. 2), *Florence* (1827) (fig. 7), *Passage of Mont Cenis* (1820) (fig. 87) and *Lake Nemi* (1840) (fig. 11) – indeed in all his watercolours.

It has always been commonly assumed that gum arabic was the only binder present in the watercolour cakes, bodycolour and gouache paints that Turner and other eighteenth and nineteenth century artists used. This is because:

i) artist suppliers such as Winsor and Newton will not divulge past or present paint recipes due to their commercial value;

ii) scholars have failed to see any merit in pursuing the subject further;

iii) the analytical technology until recently had neither been available nor aligned with practical investigation.

The assumption that gum arabic is the only binder is wrong. A whole range of different gum binders were used by Turner, other artists and colourmen suppliers during

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[2] Michael Hunter, *Robert Boyle Reconsidered* (1994:62, Cambridge University Press).

Fig. 87

the eighteenth and nineteenth centuries. Gums such as tragacanth (and possibly its cheaper substitute karaya gum or Indian tragacanth), cherry gum (whose relatives extend to plum, peach and apple species); sarcocolla, a relative of tragacanth, was also available, whilst additives such as sugar candy and honey were also used as plasticisers.

Why bother to look at the watercolour paints Turner used? After all, did he not just go down to the shop or send his father to buy what was available from one of the many artist suppliers clustered around The Strand, such as Newman's, Winsor and Newton or J Sherborn's of 121 Oxford Street?[3] In addition his acquaintance with the pioneering colour chemist and theorist George Field (1777-1854) would have kept him informed of the latest developments in paint manufacture, often with the odd sample to try out. On the face of it, he appeared not to be too concerned with the character or stability of pigments. When Mr Winsor tried to advise him on the subject, he retorted, "Your business Winsor is to make colours for artists, mine is to use them."[4]

However when the fugitive quality of indigo blue was brought to his door by the owner of one of his watercolours – the sky having faded and turned foxy red – he determined to make amends and change his habits and use cobalt, ultramarine or Prussian blue instead.[5]

It is reported that he had preferences for some colours over others. For example, an episode is cited concerning Turner's choice in the oil medium of genuine ultramarine over the cheaper artificial French version.[6] Yet on another occasion when his friend the Rev. Trimmer remarked, "Nothing is to be done without ultramarine", Turner replied, "Cobalt is good enough for me".[7] He also told Trimmer that yellow was his favourite

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[3] Townsend, *Studies in Conservation* (1993:250).
[4] Gage, *George Field and His Circle* (1989:56, 58).
[5] P Boser, *The Fugitive Mr Turner* (TS N (53), 1989:5).
[6] Gage (1989:36).
[7] Thornbury (1877:124-125).

colour, for "pictures wanted colour"[8] and Capt. George Jones told Trimmer's son, who passed on the comment to Turner's early biographer Thornbury, that Turner introduced Prussian blue into his skies as nearer nature.[9] Prussian blue is certainly found in many of Turner's watercolours, sometimes lightened with a white bodycolour or gouache in his skies, distant hills and so on – but more will be said about this later.

Although Turner's ideas on colour organisation centred around a three-colour system, red, yellow and blue - as illustrated in his series of lectures (see figs. 46 and 47) – it was not necessarily adhered to during practice. He had no settled or systematic process; theory often remained at the back of his mind during the heat of creativity.

Turner's techniques, like the content of his watercolours, are difficult to categorise and he preferred it that way. It enabled him to stay a step ahead of contemporary artists and critics alike.[10]

He mingled his subjects to create his own style. He juxtaposed and fused the past and present without getting lost in an archaeological dig. He would record precise topographical details or transmogrify a scene as he saw fit, within the instantaneous flicker of a pencil sketch, depending on the idea he had in mind. And watercolour, being such a fluid medium, was the perfect vehicle for crystallising divergent elements and ideas that he absorbed. They became frozen in time for eternity or rather as long as a watercolour can last if it is properly cared for. In Ruskin's "Preface" to his catalogue of the Turner Sketches in the National Gallery, he notes:

> It is a fact, already well known to the curators of museums, that works in water-colour lose vigour and value if they are exposed to light; and Turner's are, of all drawings, those in which such loss must be at once most extensive and fatal, owing to the excessive thinness and tenderness of the tints on which their chief effects depend.[11]

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[8] Gage (1969:19).
[9] Thornbury, ibid.
[10] Powell (1987:192).
[11] I Warrell, *Through Switzerland with Turner* (1995:33).

In turn, I will show and explain what effects different gum binders, both singularly and combined, have had on Turner's watercolour techniques; how he achieved "the excessive thinness and tenderness of the tints" which, as Ruskin recognised, made his art work.

Crucially the ratios of gum in both the successful and unsuccessful experiments are here with a record of their solubility and adhesive performance in practice.

This information has been gained with over two hundred experiments, the testing of various eighteenth and nineteenth century watercolour paint recipes, aided by paint samples taken from the edges of Turner watercolours, paints and palettes by Dr Joyce Townsend, Senior Conservation Scientist, Tate Gallery, London and Bronwyn Ormsby, PhD research student, investigating William Blake's gum and glue media, Northumbria University. Ormsby has also provided chromatographic analysis of the Turner paint samples, as well as selected experiments based upon those results.

A table prepared by Dr Townsend listing the principal watercolour paints used by Turner throughout his career (see fig. 88) and her publications[12] prove invaluable when attempting to identify and replicate his paints.

The watercolour paints Turner used

During his early years when he began to produce watercolours in his father's shop, Turner's palette centred around the rather narrow range of indigo, gamboge yellow, brown madder, black, organic red and earth colours. By the time he was 14, in 1789, he had added another two shades of earth colour, vermilion red and sap green. He continued to enlarge upon this sparse range as he went through Monro's studio, the RA and so on

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[12] Townsend, "The Materials of JMW Turner: Pigments", *Studies in Conservation*, 38 (1993:231-254) and *Turner's Painting Techniques* (1993, Tate Gallery) and "Turner's Painting Materials: A Preliminary Discussion", *Turner Studies* (Vol. 10 No. 1 p23-33).

Table 4 Turner's pigment use in works on paper, in five-year periods

Pigment	*1790*	*1795*	*1800*	*1805*	*10–14*	*(1)*	*15–19*	*20–24*	*25–29*	*30–34*	*35–39*	*40–44*	*45–49*	*(2)*	*(3)*	*(4)*	*(5)*
Reds																	
Vermilion	O	O	O*	O*	O		O*		O*	O*		O		*	*	*	O
Mars red				O			O*		O	O*		O*				*	*
Purple ochre				O			O	O	O			O					
Red organics																	
Rose madder shade																*	
Madder/Al			*			*	*		*			?		*		*	*
Madder/not Al	O	O		O		*	O*			*		O		*	*	*	
Cochineal dyestuff/Al																*	O
Madder/Fe	*						*			*						*	
Madder/Cu																*	
Madder/$CaSiO_4$									*						*		
Brasilwood																*	
Oranges																	
Mars orange	O	O		O		*				O		O			*	*	
Chrome orange						*			O			O				*	O
Yellows																	
Yellow ochre		O	O	*			*	O	O*	*	*	O*	*			*	*
Mid chrome yellow							?		O*	O*	O	O	*			*	
Pale lemon chrome							O			O						*	
Yellow organics																	
Gamboge	O	*	?	O					*	?		?				*	*
Indian yellow	*	*	*	*			*		*	*		*					?
Flavonoid yellow	*								?	?		*				*	
Unknown yellow organics																	O
Blues																	
Indigo	O	O*	O	O*	*	*	*		O	O		O			*		O
Prussian blue	O*	O		O*	O		*	O	O	*		O		*	*	-	*
Ultramarine	O							O	O*	O*	O	O*					O
Synthetic ultramarine									?							*	
Cobalt blue					?		?			O	*	O			*	*	O
Greens																	
Mixed greens	O	O		O													
Greenish ochres	O			*		*			O			O					
Emerald green										O*							
Green organics																	
Green lake/Al	*			*		*			*				*				
Green lake/Fe										*							
Unknown green lake	O	O		O				O	*				*	*			O
Browns and blacks																	
Brown madder/Fe	O*	*	*			*	?	*	?					*			
Umber					O	*	O			*			*	*	*	*	
Unknown black	O	O	O	O	O		O		O	O		O				*	O
Whites																	
Lead white		*	*	*			*		*	*	*	*	*				
Chalk			?		?					*		*				*	O
Barium sulphate			*							*				*	*		
Zinc white			*														

O = microscopical or UV identification: * = CM, EDX or FTIR as appropriate; 1 = Ashmolean palette post-1814; 2 = travelling watercolour palette; 3 = torn edges of paper and watercolour on the reverse of *George IV's Departure from the 'Royal George'* (Tate Gallery N02880) used by Turner as a drawing board; 4 = studio pigments, *c.* 1851; 5 = Royal Academy of Arts travelling watercolour palette, date unknown. The 'madders' are *R. tinctorum* L. type, and the elements detected in their substrates are indicated (Al = aluminium-containing substrate, Fe = iron-containing substrate, Cu = copper-containing substrate).

Fig. 88

during the 1790s – yellow, golden and red ochres, Indian yellow, Indian red, raw sienna, burnt umber, olive earths, Prussian and natural ultramarine blues. Lead, barium or zinc white added an opacity to his paints when he felt the need to introduce it, to produce what is known as bodycolour (see later section).

The above colours and their mixtures figured predominantly in the topographic, picturesque and sublime watercolours of his youth. The dark purples and solemn tertiaries in gloomy cathedral interiors, the blue-black storm clouds and earth brown, yellow and olive toned landscapes. Through his skilful control of tint, tone and other techniques, he still achieved effects of immense luminosity with these colours, as we shall see.

From the 1800s onwards his palette grew increasingly prismatic and so did his handling of paint especially after absorbing the effects of light on the landscape during his visit to Italy in 1819. Building on the above he increased his colour range with the coarse yet vibrant synthetic iron oxides, mars orange and red; cobalt blue (available 1802) and earthy purple ochres, burnt sienna and madder reds.

During the 1810s the brilliant chrome lemon, yellows and orange appeared on the market. They became firm favourites with Turner and may be found frequently in his watercolours until the end of his career – pigments unavailable today because of their carcinogenic nature. The above formed the central core of watercolour paints that Turner utilised (see table fig. 88) with the odd new colour such as emerald and viridian green joining his palette during the 1830s.[13]

Although the colours of the watercolour paints Turner used and those available today are broadly the same, it is worth bearing in mind some crucial differences in their textures and other characteristics. The characteristics of Turner's watercolour paints can

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[13] See Townsend, *Turner's Painting Materials: A Preliminary Discussion* (TS Vol. 10 No. 1 p23-33) and *Turner's Writings on Chemistry and Artists Materials* (TS N 1992 (No. 62 p6-10).

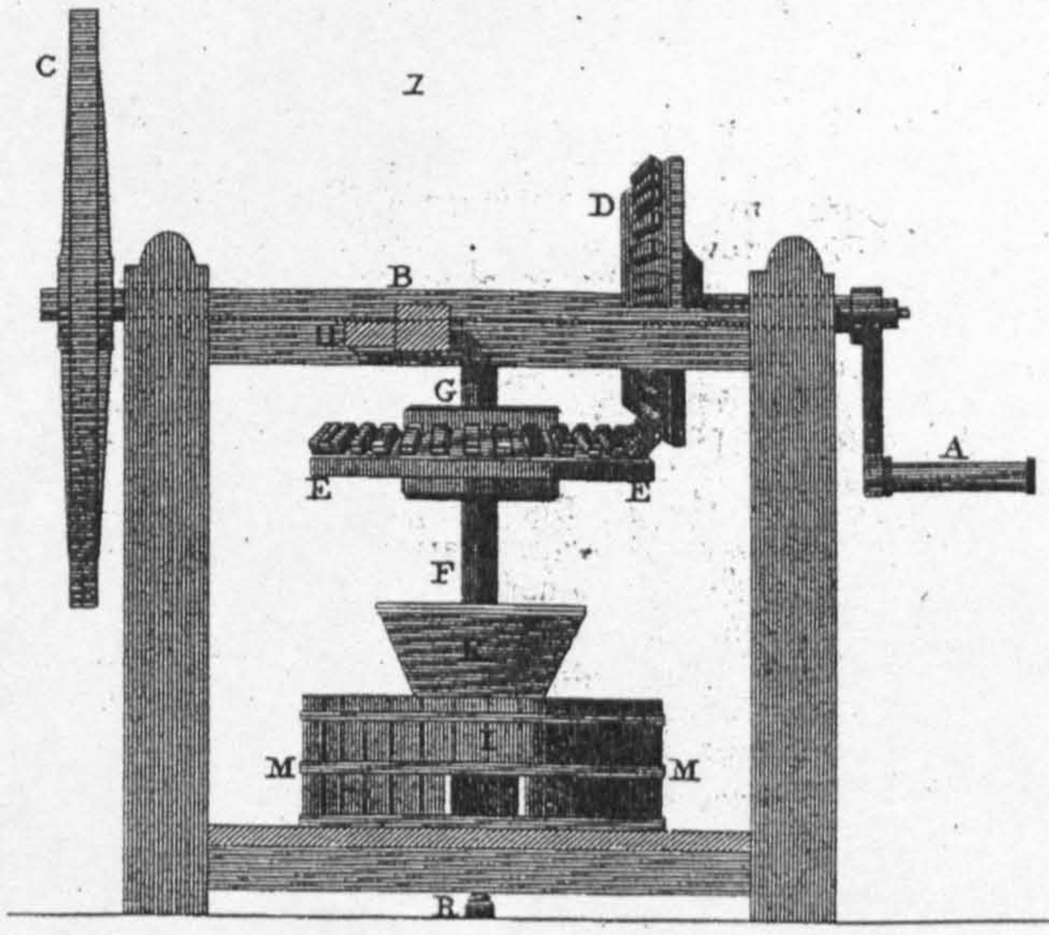
be broadly defined as (i) transparent (ii) coarse (iii) opaque.

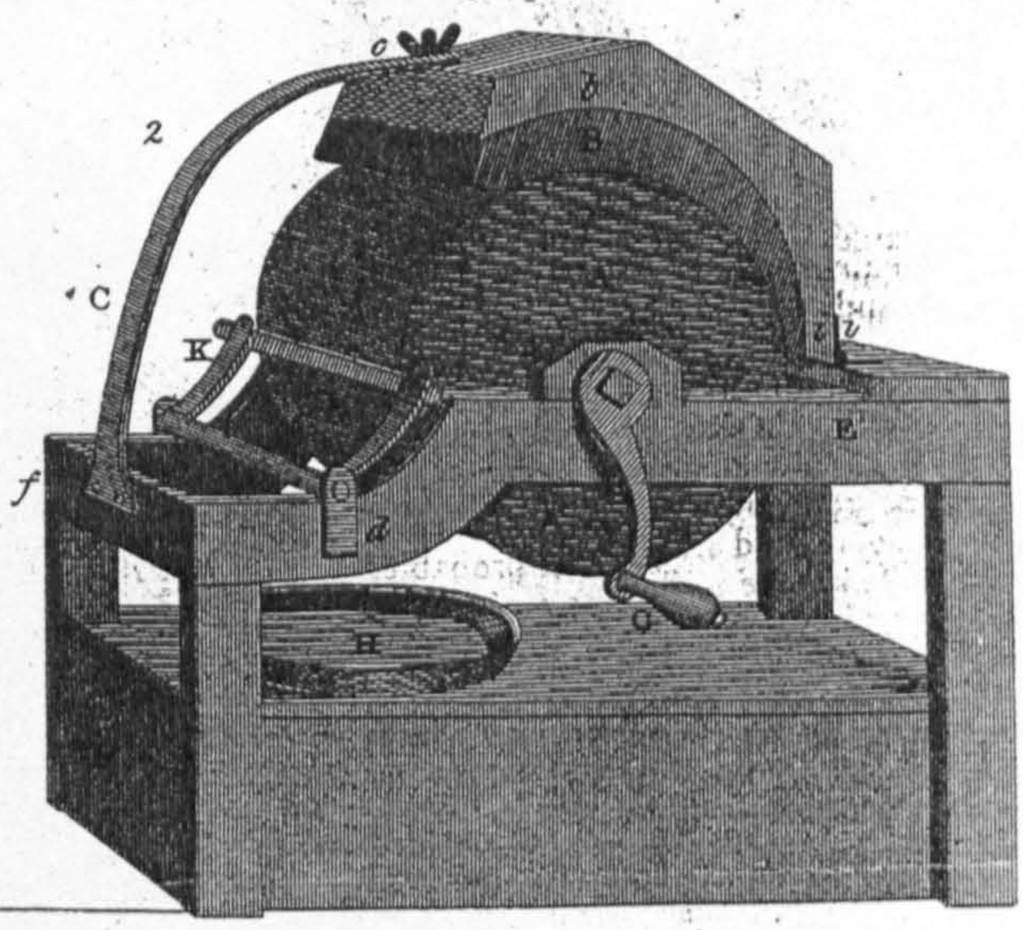
(i) Transparent: The transparency of some pigments rendered them more suitable for the gradation and layering of successive stains and tints of watercolour paint in order to build an image. Pigments of a transparent and dye-like consistency such as Prussian blue, gamboge yellow, madder reds and semi-opaque chrome yellows belong in this class.

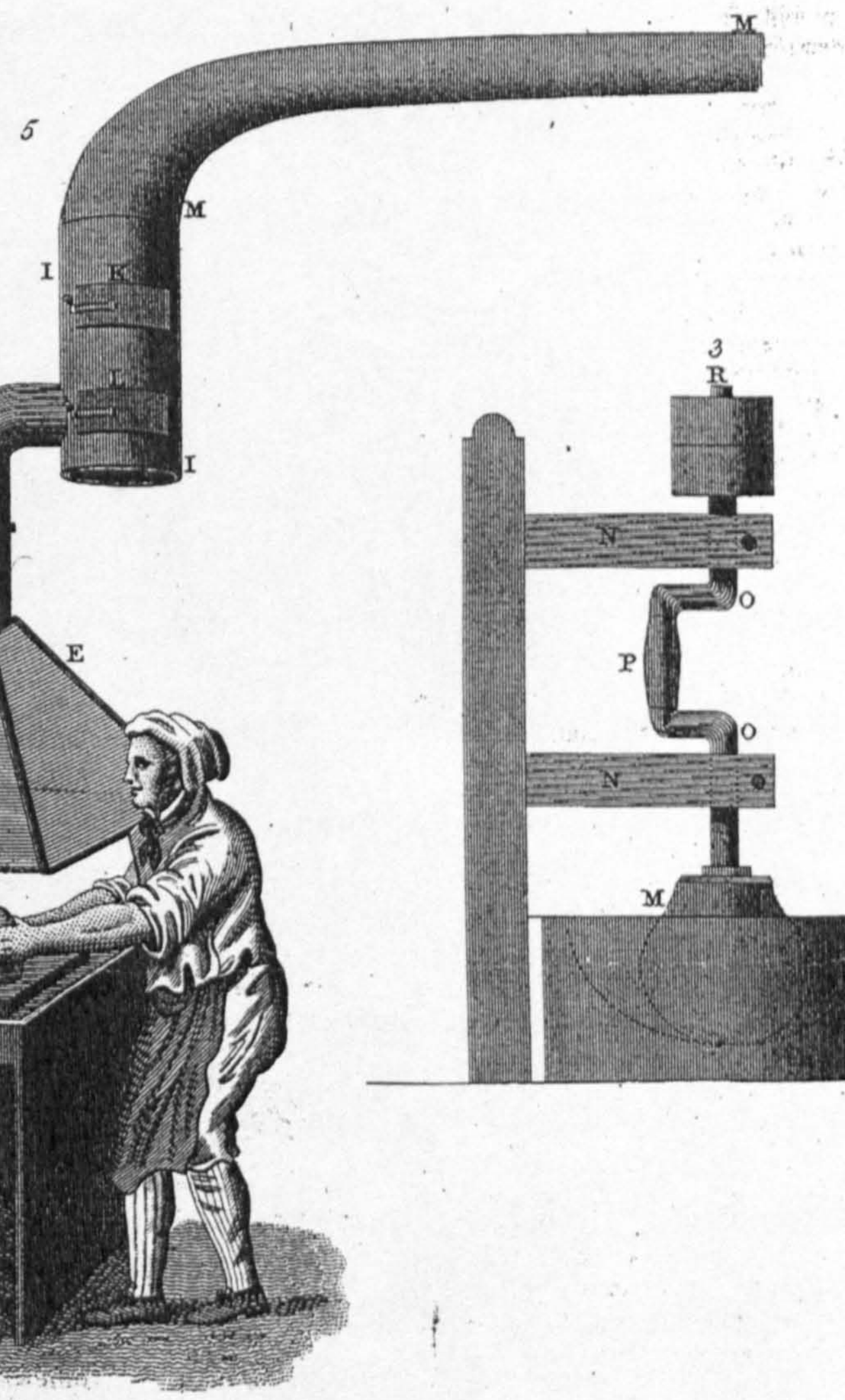
The heavier particles found in coarse and opaque pigments, if mixed with transparent paint, will disperse more easily and produce interesting tonal mixtures. For example, the naturally gum based gamboge yellow mixed 50/50 with a grittier, earthier yellow ochre brightens the ochre and produces a tonal mixture combining translucency and opacity.

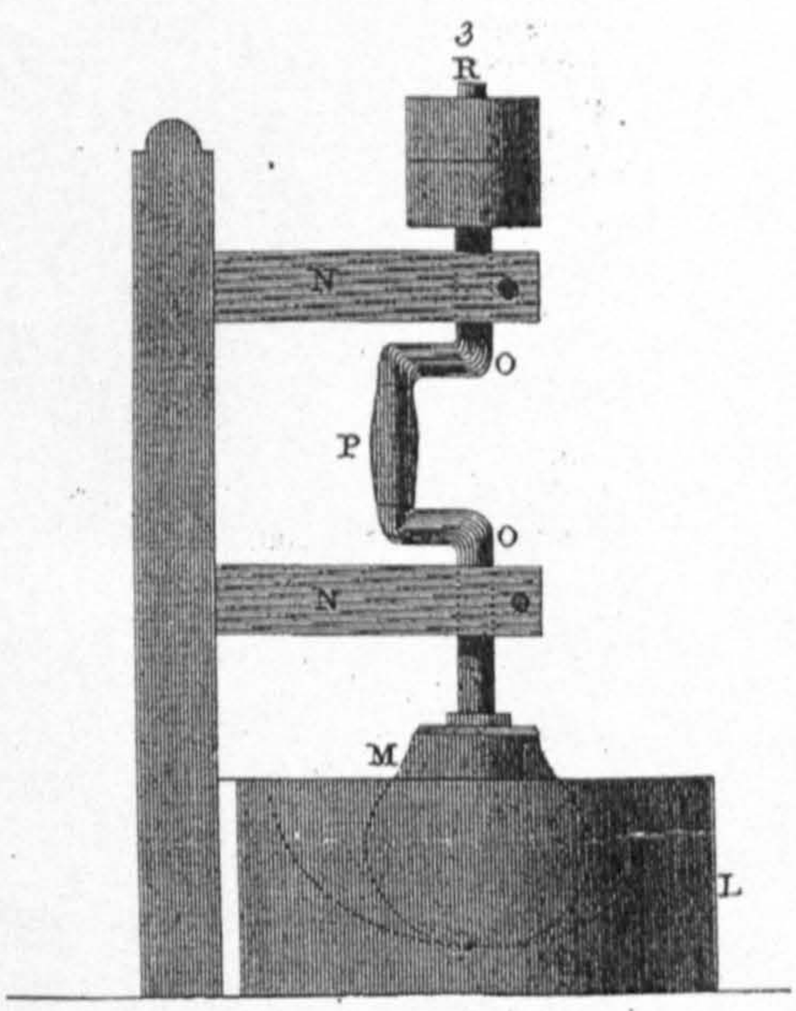
(ii) Coarseness: The inherent coarseness and gritty texture of paints such as genuine ultramarine lapis lazuli, yellow, red and purple ochres stem from the fact that they formed naturally in the bowels of the earth. Even synthetic iron oxides, mars reds and oranges produced chemically vary in tone and particle size and were coarser during Turner's era than those manufactured today. The coarse particles and 'atoms' in these paints often mingle inadvertently with minute fragments of painted marks such as stipples and hatchings (see fig. 64). Together they help to produce iridescent and indefinable tones which can be found in many of Turner's watercolours, *The Dark Rigi* (1842) (fig. 2) and *Prudhoe Castle* (1825) (fig. 18) for example, but they are not the sole reason; much depends on skill.

The handgrinding of pigments by many colourmen during Turner's era meant that the grinder could judge by hand, eye and experience just how much to grind the pigment (see fig. 89). Different pigments required different grinding









J.Pass sc.

1. Common Colour Mill. 2. Rawlinson's Colour Mill.
3. 4. Improved Indigo Mill. 5. Apparatus for the protection of Colour Grinders.

Engraved for the Encyclopædia Londinensis 1824.

Fig. 89

times, depending on their compositional make-up. For example, lapis lazuli, if ground too much, will produce a grey-toned rather blue paint.

This practice was gradually superseded by machines as the nineteenth century progressed, the pursuit of standardisation in pigment texture, tone and colour gaining momentum.

(iii) Opacity: Some paints such as vermilion and mars reds and oranges are opaque by their very nature. Additives can also contribute to a paint's opacity: White barium sulphate in chrome lemon and some madder reds and green lakes Turner utilised contain clay bases (see table fig. 88).

However, the main source of opacity in Turner's watercolours derives from his use of bodycolour or gouache; they are discussed in detail in a later section.

Putting them together

There were instances when Turner chose to paint in pure transparent watercolour (fig. 63) or opaque bodycolour (fig. 90) and many other occasions when each element in the above matrix became almost indistinguishably blended in his work (figs. 11 and 18). It all depended on what he felt the occasion demanded. Turner would also produce subtle blends and variants of the same hue by modifying a Prussian, cobalt, ultramarine or indigo blue with different combinations of each other on his palette. The same applied to the other primary reds and yellows. Townsend noted he would warm his yellow ochre sometimes with a little vermilion[14] and there was nothing to stop the colourmen suppliers or ourselves from doing the same.

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[14] Personal communication, June 1993.

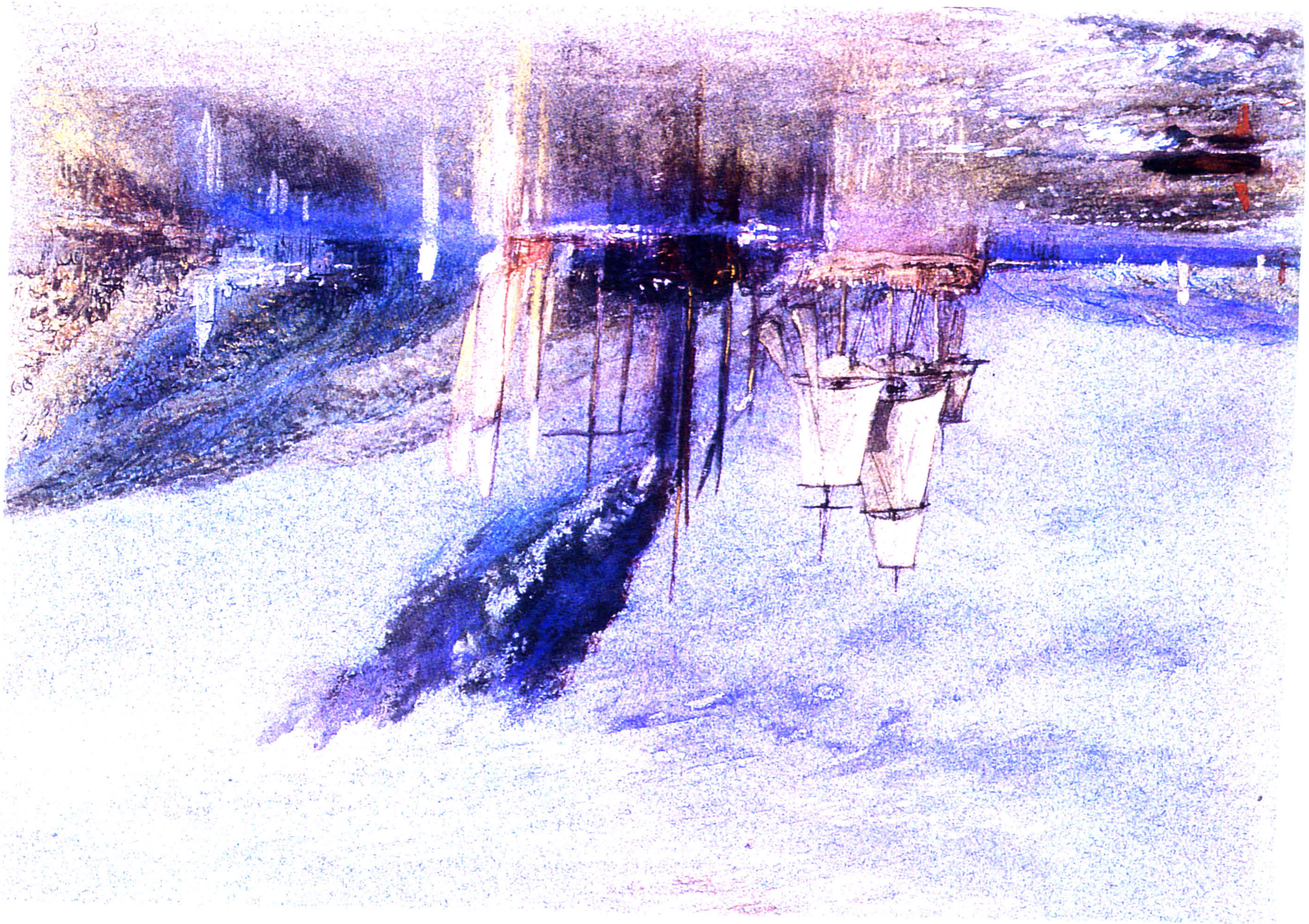

Fig. 90

The effect was compounded when mixing complementary greens, oranges and purples plus their tertiary combinations. This complex blending of colours and textures should be borne in mind when attempting to identify any colour in a Turner painting.

Late eighteenth and early nineteenth century watercolour blocks including moist cakes, their components and characteristics

Dry cakes, blocks or lozenges of watercolour paint, as they were sometimes referred to, were invented by William Reeves around the date of 1766.[15] The idea may have been inspired by the practices of pharmacists and their manufacture of medicines in tablet form.[16]

Reeves paints soon became available in artist suppliers and stationers sold as separate cakes or in wooden boxed sets complete with palette and sometimes jars of medium (see fig. 91). The idea was copied by a whole range of artist suppliers such as Ackermann's, Sherborn and Co., Winsor and Newton, Roberson and Rowney, among many others.

The constituents of these hard cakes were principally ground pigment mixed with acacia gums arabic or senegal – though other gums such as cherry, tragacanth and their relatives found their way into recipes, both at the merchant, gatherer's source and colourmen's discretion - pure water and sometimes a small addition of sugar candy or honey to prevent fracturing and drying out. The blocks are like hard boiled sweets and so hard that the colour could often only be released by vigorous brushing or by rubbing onto a wet plate. Ox gall, it was found, assisted the lifting and dispersal of the colour and was sometimes added by manufacturers when making the cakes, or by artists applying it on

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[15] Michael Goodwin, *Artist and Colourman* (1966:17, Reeves and Sons Ltd).
[16] See *Drugs and Narcotics in History*, ed Roy Porter and Mikulas Teich; John Scarborough, *The Opium Poppy in Hellenistic and Roman Medicine* (1996:8-9, Cambridge University Press).

Isaac Smith's paint box

Fig. 91

the dry cake to re-moisten it.

I confirmed the difficulty of lifting colour in this manner when I tested with brush and water the cakes contained in an antique watercolour box at the Dean Gallery, Newcastle (1993).

Turner used these hard cake colours from his youth until the end of his career; they were also found stuck into an empty book cover to form a makeshift travelling palette[17] (see fig. 92; see also another example c1842 (fig. 95) which will be discussed in turn).

A box of Reeves watercolour paints circa 1800, as well as other makers cited above, were sampled and chromatographically analysed by Bronwyn Ormsby (Northumbria University) (see the table in fig. 93).

As mentioned earlier, the acacia gums were combined in some instances with other gum species which were also soluble in water, and of an adhesive nature. Cherry gum and its relatives, peach, plum and apple gums have been used as pigment binders since antiquity. Tragacanth and honey were mixed as a tough watercolour paint binder by the ancient Egyptians and undoubtedly combined with other gums and resins.[18]

Daniel V Thompson, in his book *The Materials and Techniques of Medieval Painting* (1956:57-58, Dover pub.) states:

> It is hard for us to realise how very superficial the identification of raw materials used to be. If the gum of a cherry-tree or a plum-tree looked enough like gum arabic, gum arabic it became in medieval trade. Cherry-trees and plum-trees and almond-trees all yielded gums which were used in place of gum arabic and along with it, though their solutions are quite different from solutions of gum arabic.

During the eighteenth and early nineteenth centuries, soluble gums and resins were being imported into Great Britain from around the world notably by the East India

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[17] Townsend, *Studies in Conservation* (38, 1993:236-237).
[18] Hilaire Hiler, *Notes on the Technique of Painting* (1969:221, Faber) and Maria Bazzi, *The Artists Methods and Materials* (1960:110) discuss the Egyptians' use of tragacanth and honey as a paint binder.

Fig. 92

Reeves watercolour cakes from Museum of London - initial GCMS results

SAMPLE	Institution	EDXA?	Diagnosis by Eye - gums
343/3 - light red /vermilion?	MOL - Reeves	Joyce?	Looks like gamboge +/Arabic
343/7 - gamboge	MOL - Reeves		Gamboge trace
343/7 - indigo	MOL - Reeves		Arabic + sugar
343/7 - vermilion	MOL - Reeves		Arabic + sugar
343/7 - verditter?	MOL - Reeves		Arabic + cherry? + sugar
343/10 - gamboge	MOL - Reeves		Gamboge + Arabic
343/10 - Prussian green	MOL - Reeves		Arabic + karaya + sugar
343/10 - red chalk	MOL - Reeves		Arabic + cherry? + sugar
343/10 - light red/ vermilion	MOL - Reeves		Arabic + karaya? + cherry? + sugar
343/10 - green bice	MOL - Reeves		Arabic + karaya? + cherry? + sugar
343/10 - indigo	MOL - Reeves		Arabic + karaya? + cherry? + sugar
343/10 - Prussian blue	MOL - Reeves		Arabic + karaya? + cherry? + sugar
343/14 - gamboge	MOL - Reeves		Gamboge trace
343/14 - indigo	MOL - Reeves		Arabic + karaya + sugar
343/14 - red chalk	MOL - Reeves		Arabic + major sugar
343/18 - gallstone 1	MOL - Reeves		Arabic - like gamboge trace
343/18 - gallstone 2	MOL - Reeves		Arabic - like gamboge trace
343/18 - blue verditer	MOL - Reeves		Arabic + ? + sugar
343/18 - yellow lake	MOL - Reeves		Arabic?
343/18 - indigo	MOL - Reeves		Arabic
343/18 - light Prussian blue	MOL - Reeves		Arabic + karaya? + sugar
343/18 - Romoker, gamboge?	MOL - Reeves		Gamboge trace
343/18 - purple madder	MOL - Reeves		Arabic + sugar
35.39 - C - medium	MOL - Reeves		Not a gum
35.39 - I - medium, no cork	MOL - Reeves		Arabic + cherry/trag + sugar
74.343/3 c.1791	At the King's Arms and Blue Coat Boy No. 80 Holborn Bridge		
74.343/7	Address: At the King's Arms and Blue Coat Boy, No. 299		
	near the NEW CHURCH, STRAND, LONDON		
62.120/56	Isabella Tyler 1785-1868		
35.39	Not Reeves archive - said to be Reeves and Inwood Address:		
	Reeves and Inwood at the Kings Arms and Blue Coat Boy		
	No. 300 NEW CHURCH, STRAND, LONDON.		
74.343/18	Address: W.I. Reeves and Son - 80 Holborn Bridge, LONDON		
74.343/14	Address:No. 80	C.1800	
73.343/10	Ladies Boudoir Box c.1800		

35-40% Kar

50% , 10% K. Ch.

30% Kar

50% 10% 40% Ar Trag Cherry.

medium 35.39 I = ↑50% A j 5% Sugar j 10% Trag ‖ 30% Cherry. } approx?
↓ 20% ‖ ↓ 10%

35% Arabic 35% Karaya 10% Cherry 5% Trag 15% Sar = 53 Closest Yet.

35% Arabic 45% Karaya 20% Cherry for Prussian green / ~~Red Chalk~~ light Prussian Blue

Yet 35% Arabic 35% Karaya 10% Cherry 10% Tragacanth 10% Sarcocolla No 40 + No 66 seemed Best Yet no wash up.

Bronwyn Ormsby
August 2000

Fig. 93

Company. Mixtures of gums occurred at the sorting centres of the country of origin such as India, the Middle East, Europe or by the colourmen before they were prepared for paints or sold to artists in their raw state as a conglomerate named simply gum.[19]

Thompson, in the above book (1956:45), recognised, "Binding media always have a certain influence upon a pigment's behaviour ... The transparency of any pigment is affected by the medium which surrounds its particles and by the amount of medium mixed with it".

Gum assists the colloidal dispersion of watercolour paint, ie. how the pigment particles disperse in water and on the paper, by preventing coagulation and precipitation of the particles until they are gummed in place. "The dried gum alters the refractive index of the coating by filling any remaining irregularities with a transparent film." Thus the pigmented surface becomes more transparent to light reflected from the paper below, much as wet frosted glass is more transparent than dry. Accordingly a pure and undisturbed wash gains noticeably in depth and intensity of hue; gum makes watercolours "bear out".[20]

Rudolf Ackermann, colourman and supplier with an outlet around The Strand, London, announced in 1813 that "the preparation of water-colours has almost attained perfection".[21] His recipe for making watercolours can be seen in fig. 94 and forms the basis of an experiment outlined in a following section.

The above developments, along with Whatman's introduction of wove paper (fig. 75) around 1754, and Reeves watercolour cakes, circa 1766, were precisely what CF Bell had in mind when he commented in the introduction to *A List of the Works Contributed to*

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[19] See *Exhibition of the Works of Industry of All Nations, 1851, Reports by the Juries* (1852:71-78, London, printed for the Royal Commission).
[20] Cohn, *Wash and Gouache* (1977).
[21] Cohn, ibid. (p54).

Public Exhibitions by JMW Turner (1901):

> It will, perhaps, always remain doubtful whether ill-sized paper and feebly-toned pigments were among the causes which contributed originally to the rise of the stained manner, but it is unquestionable that without the great improvements made towards the close of the eighteenth century and early nineteenth century in the manufacture of artists materials, no such revolution as that which gave birth to modern water-colour art could have been carried through.

The introduction of moist watercolour cakes

Some colourmen – because of the hard and gritty nature of the above blocks – continued to experiment with binders and hygroscopic agents which would hold atmospheric water within the cake and predispose it to softening and dissolving more readily.[22]

In 1835 Winsor and Newton introduced pans of moist watercolour cakes, and tubes in 1846. By adding between 5-20%[23] glycerine syrup, the paint retains its moisture and with the machine grinding of pigments, smoother paint textures were produced which lifted more easily from the cake.

Indeed it was around 1846 that the watercolourist David Cox (1783-1859) suggested that the harder watercolour cakes were superior to the newer moist cakes and that the former produced the most brilliant wash effects. Glycerine, some believed, diminished the colloidal dispersion of the pigment particles and their even settlement on drying. In addition, too much glycerine and sugar not only made the paint more soluble but more likely to wash up on the sheet when working over the top of it. This would prove problematic when laying tint upon tint or when employing more vigorous techniques such as re-soaking, rubbing and scraping.

AJ Finberg, a Turner biographer, wrote in 1917, "many artists have gone back to

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[22] Cohn, ibid. (p55).
[23] Mayer, *The Artist's Handbook* (1991:439).

the use of hard cakes … with which the earlier men obtained their delicate and luminous results". Otherwise only "engineering and architectural draughtsmen" used hard cakes, presumably to guarantee the greatest possible transparency in their drawing.[24]

It is well known that Turner trained with architects during his youth and that he used hard cakes throughout his career. A travelling watercolour box which Turner made up (circa 1842) with a sheet of fine black canvas contained predominantly hard cakes, approximately 24 in total, stamped with the colourman's name, Sherborn (see fig. 95). Only a few were moist in pans.[25] Samples were taken from this box and chromatographically analysed by Ormsby (see fig. 104).

One recipe for making hard watercolour cakes during Turner's era can be found in Rudolf Ackermann, *A Treatise on Ackermann's Superfine Watercolours with instructions on how to prepare and use them* (1801:13-20, London) (see fig. 94).[26]

A preliminary experiment

Ackermann's treatise informed the following experiment on 22 March 1998. Gum senegal was used as the principal binding agent, along with sugar candy (pure cane sugar bought in a Chinese supermarket).

The wholesale measurements cited by Ackermann on page 18 were converted into smaller manageable quantities. A ¼ pint of distilled water, 1½oz gum arabic and ½oz sugar candy were dissolved in an enamel bowl. Filtration with blotting paper was unnecessary due to the purity of the contents.

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[24] Cohn, ibid. (p55).
[25] William T Whitley, *Relics of Turner: The Connoisseur Magazine* LXXXVIII (1931:198).
[26] Ackermann's treatise recommended the study of Turner and Girtin's watercolours, among others. Turner's half finished watercolours painted around this date not only provide an insight into his style but ample instruction on how to proceed in the flat tint manner described in detail herein.

Preparation of Colours for Oil Painting, according to the new and generally adopted Method.

When the colours, after they have been finely ground with diſtilled Water, are perfectly dry, grind them again upon a marble plate, in ſmall quantities, with Eſſence of Turpentine. When dry, pound them in a mortar of porphyr, or porcelain, paſs them through a fine ſilk ſieve, and put them into a glaſs bottle, well corked. When you want to make uſe of them, put a ſmall quantity of a colour upon the pallette, add a drop of the oil with which you intend to paint, and mix the whole with an ivory knife, and you will find the colour perfectly united.

Preparation of Colours for Painting in Miniature, Landſcapes, Flowers, Shells, &c.

The colours muſt be mixed upon the marble plate with the following different liquids, viz.

First Compoſition—To two quarts of diſtilled Water, add twelve ounces of Gum Senegal, and five ounces of Sugar Candy; let the whole be diſſolved in a vapour bath, and filter it afterwards through blotting paper.

Second Compoſition—To a veſſel, containing two quarts, pour in one pound of diſtilled Vinegar, fourteen ounces of Gum Senegal, ſix ounces of Sugar Candy, two ounces of white Honey, and fill it up with diſtilled Water; let it diſſolve and filter it.

Third Compoſition—Take two quarts of diſtilled Water, five ounces of Gum Arabic, and two ounces of Sugar Candy, diſſolve and filter it.

Fourth Compoſition—Diſſolve three ounces of Gum Senegal and one ounce of Sugar Candy in two quarts of diſtilled Water, and filter it.

Colours

Colours to be prepared with the firſt Compoſition.

Ackermann's Yellow	Enamel Blue	Olive Green
Antwerp Blue	Egyptian Brown	Pink
Azure Blue	French Green	Purple
Azure Green	Green Earth	Patent Yellow
Brown Red	Indian Red	Sanders Blue
Burnt Umber	Iris Green	Sanders Green
Blue Earth	Lake	Sienna Earth
Brown Pink	Mars Red	Vandyke Brown
Black	Mars Yellow	Violet Blue
Cologn Earth	Mineral Green	Vermillion
Dutch Pink	Orpiment	Umber
Dragon's Blood	Ochre	

To be prepared with the Second Compoſition.

Biſter, Pruſſian Blue, and Burnt Carmine.

Colours for the Third Compoſition.

All the different Whites, and it is very neceſſary to ſelect the pureſt ſorts and to grind them extremely fine.

Colours for the Fourth Compoſition.

Carmine, Precipitate of Gold, Ultramarine, Smalt.

Colours in the Preparation of which no Iron Knife ought to be uſed.

The Whites, Smalt, Orpiment, the Yellows (the Ochres excepted) Orange Lead, Ultramarine, Carmine, Lake, Gall-ſtone.

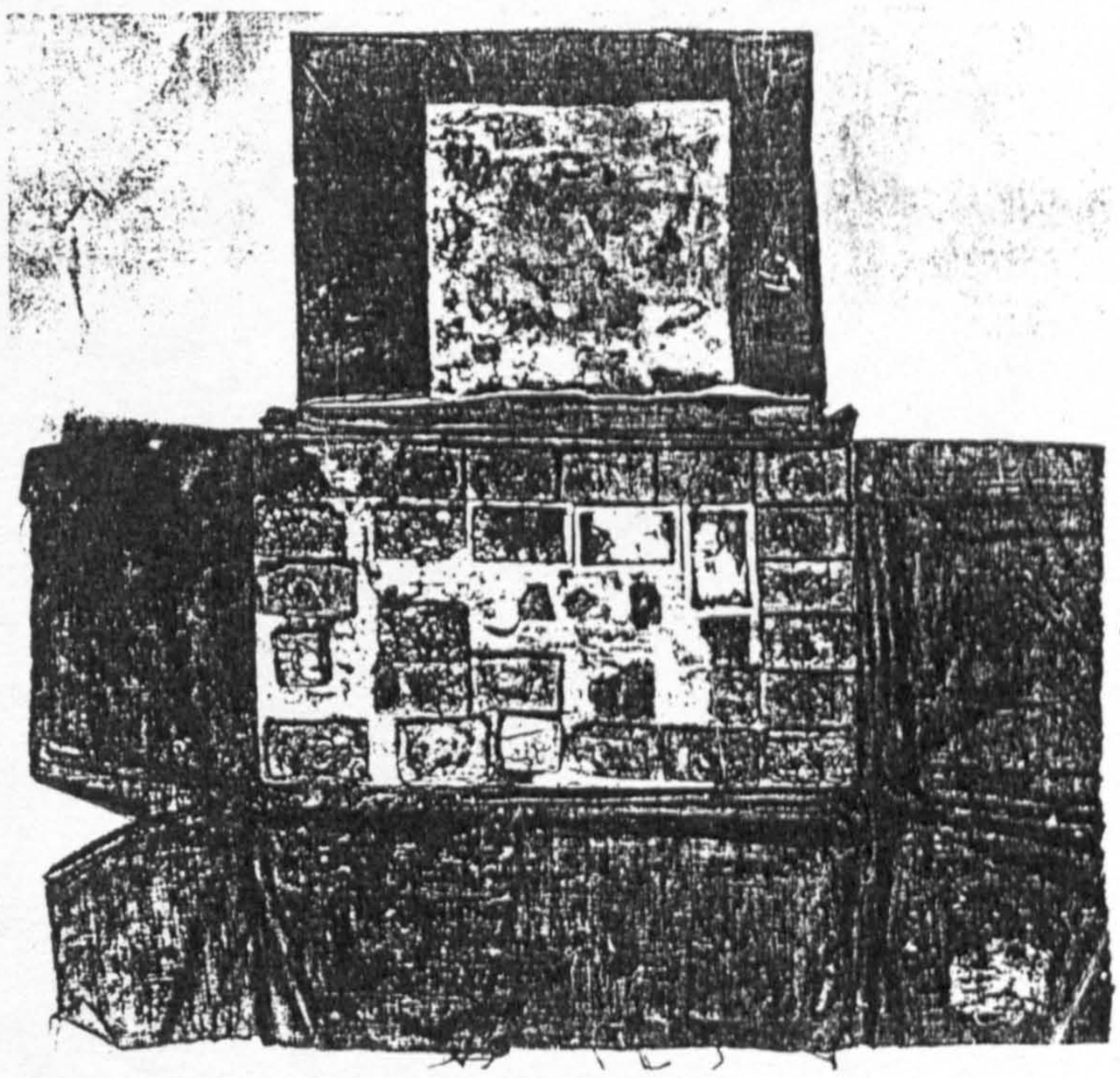
After the colours are thus prepared, let them dry, and pound and ſift them as before-mentioned, and keep them in the manner recommended.

☞ The above compoſitions contain the exact quantity required for the ſeveral colours to produce that durability ſo much wanted, without injuring either their quality or brilliancy.

Ackermann's White, a new Colour, ſuperior to any White hitherto known, both in working it, and alſo in its durability.

Ackermann

Fig. 94



TURNER'S TRAVELLING WATER COLOUR BOX
AT THE COTSWOLD GALLERY, LONDON

Fig. 95

Once dissolved, the gum binder solution was added to the pigment – about 4 teaspoons – a few drops at a time and mixed upon a ceramic plate using a pliable metal palette knife.

Mixing differed for each pigment, ie. grittier earth colours such as yellow ochre, iron oxides and mars red/orange soak up more gum solution that the range of chromes and have a consistency similar to wet mud or soft butter.

When the knife was lifted 3-4 inches from the plat and the mixture flowed slowly from the knife to plate – rather like a thick treacle – the mix was deemed ready to be placed into empty watercolour pans. A fluid, runny mix indicates too much gum solution-to-pigment ratio; alternatively if the mix drops in lumps, too little solution is present. Once filled, the watercolour pans were left to set for 36 hours; the results can be seen in fig. 96 which includes several modern Winsor and Newton watercolour paints for comparison; the pigment suppliers are also indicated.

The inclusion of sugar candy did appear to facilitate the wash up of tints, that is, undercoats were disturbed if successive layers of paint film were applied or brushfuls of water. Obviously some wash up and disturbance of tints is to be expected but further experiments outlined later in this chapter reveal more effective ratios and ingredients to match Turner's paint films and techniques.

We now know that Turner used a whole range of commercial watercolour cakes from the artefacts and evidence he left behind in his studio after his death – home made watercolour carrying cases and paint boxes, references in his sketchbooks to material purchases made and recollections of colourmen serving him in suppliers such as Winsor and Newton and Sherborn and Tillyer.

However a much neglected part of his practice in the medium is his use of bodycolour, gouache paint, watercolour mediums and the question of whether he made

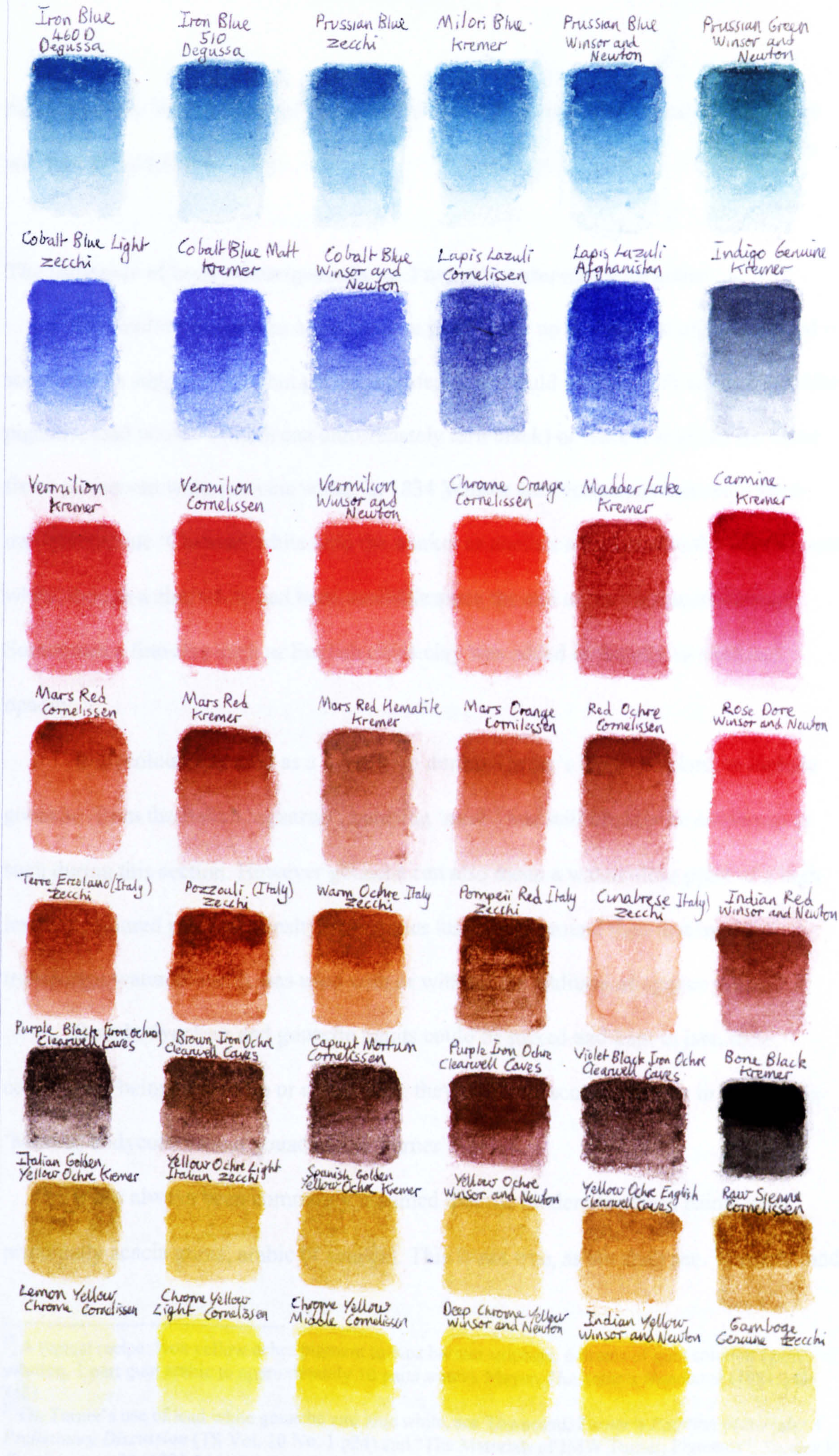

Iron Blue 460 D Degussa
Iron Blue 510 Degussa
Prussian Blue Zecchi
Milori Blue Kremer
Prussian Blue Winsor and Newton
Prussian Green Winsor and Newton
Cobalt Blue Light Zecchi
Cobalt Blue Matt Kremer
Cobalt Blue Winsor and Newton
Lapis Lazuli Cornelissen
Lapis Lazuli Afghanistan
Indigo Genuine Kremer
Vermilion Kremer
Vermilion Cornelissen
Vermilion Winsor and Newton
Chrome Orange Cornelissen
Madder Lake Kremer
Carmine Kremer
Mars Red Cornelissen
Mars Red Kremer
Mars Red Hematite Kremer
Mars Orange Cornelissen
Red Ochre Cornelissen
Rose Dore Winsor and Newton
Terre Ercolano (Italy) Zecchi
Pozzouli (Italy) Zecchi
Warm Ochre Italy Zecchi
Pompeii Red Italy Zecchi
Cinabrese Italy) Zecchi
Indian Red Winsor and Newton
Purple Black (Iron ochre) Clearwell Caves
Brown Iron Ochre Clearwell Caves
Caput Mortuum Cornelissen
Purple Iron Ochre Clearwell Caves
Violet Black Iron Ochre Clearwell Caves
Bone Black Kremer
Italian Golden Yellow Ochre Kremer
Yellow Ochre Light Italian Zecchi
Spanish Golden Yellow Ochre Kremer
Yellow Ochre Winsor and Newton
Yellow Ochre English Clearwell Caves
Raw Sienna Cornelissen
Lemon Yellow Chrome Cornelissen
Chrome Yellow Light Cornelissen
Chrome Yellow Middle Cornelissen
Deep Chrome Yellow Winsor and Newton
Indian Yellow Winsor and Newton
Gamboge Genuine Zecchi

Fig. 96

his own paints. What effects they produced singularly or combined, blended, in practice will now be addressed.

The influence of bodycolour/gouache on Turner's watercolour practice

Bodycolour constitutes a watercolour paint made up of coloured pigment mixed – some recipes suggest 50/50 but personal preferences would vary[27] - with an opaque white pigment, lead white[28] (which can unfortunately turn black) or barium sulphate (or blanc fix or permanent white) or zinc white. In 1834 Winsor and Newton introduced a semi-transparent zinc 'Chinese' white onto the market as another alternative to the fugitive lead white, though a zinc white had been available since the end of the eighteenth century. Sometimes a fine clay such as English china clay was added to the mix to reinforce opacity.

Bodycolour was used as a loose term during Turner's era and before, to include gouache (from the Italian 'aguazzo', meaning 'mud') and will broadly be employed as such during this section. However gouache can also mean a watercolour paint of a high level of coloured pigment density, sometimes less finely ground than that used for transparent watercolour. It was used with or without the addition of opaque white.

Both bodycolour and gouache paints could be mixed and kept in jars, their consistency being of a syrup or cream-like; they will be discussed further in the section 'Making bodycolours and gouache like Turner's'.

It has always been commonly assumed that the binders for these paints were principally acacia gums, arabic or senegal. This is not true, as we shall see. Turner's (and

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[27] A typical recipe: ¾oz yellow ochre pigment to ¾oz barium sulphate, 6 drams of gum solution (gum solution, 1 part gum arabic to approximately 10 parts water). Mayer, *The Artist's Handbook* (1981:341-343).

[28] On Turner's use of lead white gouache and zinc white, see Townsend, *Turner's Painting Materials: A Preliminary Discussion* (TS Vol. 10 No. 1 p24) and "The Materials of JMW Turner, Pigments", *Studies in Conservation*, 38 (1993:236-237, 241, 244-245, 247, 251).

other artists') bodycolour and gouache contained other gums as well, which made them perform quite differently to purely acacia, arabic/senegal based paints.

Perhaps the most influential English exponent of bodycolour was Paul Sandby (1731-1809).[29] His works were exhibited around London and held in collections including Monro's studio[30] where young Turner worked.

However the use of bodycolour was no arcane secret. It had been used by the ancient Egyptians, medieval illuminators and miniature painters and mixed with other mediums, oil- and egg-based, by many artists including old masters.[31] Its use continued into the eighteenth, nineteenth and twentieth centuries. Turner may have been introduced to its potential during his youth as he trawled the colourmen suppliers around The Strand, the RA or whilst working as a scene painter in 1791 at the Pantheon Opera House, Oxford Street, where substantial amounts of water based paints needed to be mixed in order to cover large areas.

What marked Turner from his contemporaries was his willingness to blend translucent watercolour with opaque bodycolour almost indistinguishably in many of his watercolours. This break from a tradition that the two should be kept separate enabled Turner to achieve startling innovatory effects. Since he was no longer tyrannised by the concept of pure watercolour, the only question for Turner about a technical process was 'does it work?'.

Turner often employed the medium in every degree of dilution. Sometimes he

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[29] Wilton/Lyles (1993:16).
[30] TS vol. 4 no. 2 p8.
[31] Painters in ancient Egypt, antiquity and medieval illuminators could obtain opaque tones with the addition of lead white or gesso (calcium sulphate). Albrecht Dürer (1471-1528) produced exquisitely detailed nature studies in bodycolour whilst Italian and French painters used it for painting on fans and for copying oil paintings. Marco Ricci (1676-1729) produced meticulous copies in watercolour/bodycolour after old masters of the Flemish draughtsman Bernard Lens III (1681-1740) – very much in the style of Claude Lorrain and Nicolas Poussin which typified the use of the medium in England. The Huguenots (often associated with technical innovation and developments) Louis (1700-1747) and Joseph Goupy (1680-1768) were also noted exponents of the medium.

would introduce pure white bodycolour into his water vessel until it reached the consistency of thin milk, then mix it with watercolour paint to produce subtle semi-transparent washes and flat tints. The effect can be seen in early watercolours such as *St Erasmus in Bishop Islip's Chapel, Westminster Abbey* (1796) (fig. 97). Areas of masonry have been built up with preliminary stains and tints of translucent watercolour paint and washes of semi-transparent bodycolour, the interplay between the two reinforcing the effects of textured stone and paving the way for elaborate details.

Cohn, in her book, *Wash and Gouache* (1977:51), suggests the dilution of bodycolour in the water vessel as a Turnerian innovation; citing its use in a later watercolour, *Simplon Pass* (fig. 62), she states:

> White was used as a dilute medium in the wash style. The white (Chinese white?) added to a considerable amount of water. This seems to have been Turner's innovation and it may be seen in his *Simplon Pass*. White has been added to several passages in this painting, not merely to represent an Alpine glacier but to suggest the glimmering sublimity of the idea of mountains, of their hoary old age, and of the ancient forces that formed them.

In the same dilute manner, distant blue mists and like phenomena can be established. However Cohn does not elaborate on the context of the technique for which its success depends. As we shall see, dense materials and surfaces, rocks, buildings and various textures found in terrain may be established with a combination of transparent tints and opaque bodycolour. In addition, Turner also employed bodycolour in an almost dry scumble; this too can give the effect of pastels[32] (ie. fully loading the brush not too wet and applying the paint in a scrubbing motion, often picking up on the texture of the paper). His early Wilson sketchbook (1797) (fig. 98) contains examples of this technique. Martin Hardie, in Volume II of his three-volume series *Watercolour Painting in Britain* (1967:33) highlights Turner's used of bodycolour in watercolours painted from the 1820s

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[32] Wilkinson (1975:14).

Fig. 97

Fig. 98

onwards:

> In these Rhine subjects – such as Marxbourg Abbey near Coblenz and Brübrich Palace [fig. 99] in the British museum – he used bodycolour with the same mastery with which he had long handled the transparent medium and used it rightly for the recording of rapid impressions which required no wrought out elaboration. The Mainz and Castel [figs. 13 and 14] may be noted as showing Turner in experimental mood. The dark cloud in the sky was obviously produced by letting colour drop and splutter on a very wet paper, in contrast with the dry work of the sky on the left and the crisp touches which give notes and accents on the boats. Later, in 1826, when he explored the Meuse and the Moselle, he worked in a similar way on sheets of actual blue paper, not a paper primed with blue. Body-colour was used with a pleasantly pastel like effect. Details of architecture and landscape were indicated by touches of brown ink added with a pen. Possibly by this time he had commenced his practice of mixing Chinese white in his water vessel, bringing the water to the consistency of thin milk. The slight opacity which this gave to his pigments would account for their somewhat dry appearance, as of pastel.[33]
>
> The techniques of "letting colour drop on a very wet paper" to achieve

spontaneous cloud effects, alongside areas of "dry" brush work in the sky are just two

devices from Turner's mark-making repertoire.

The dry pastel appearance Hardie refers to in Turner's work was very much in evidence when I examined the *Marxbourg and Brübrich Palace* watercolour (fig. 99), among others on display at the Lloyd Bequest exhibition, British Museum, September 1998.

Obviously the inclusion of opaque whites into his paint, whether they be lead, barium or zinc, would produce pastel-like textures. Any traces of clay bases added to pigments by colourmen, ie. Prussian blues, madder reds, carmine and so on, would

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[33] Martin Hardie, *Watercolour Painting in Britain*, vol. I, "The Eighteenth Century" (1967); vol. II, "The Romantic Period" (1967); vol. III, "The Victorian Period" (1968).

Fig. 99

contribute to a lesser degree.[34] A series of experiments involving their mixture and combination with pigment are described in a later section.

Bodycolour enabled Turner to incorporate oil painting techniques into his watercolour practice, for like oil paint, the medium achieved its lighter tones by gradually increasing the amount of white into the paint. This produced an immense range of tones, though Turner's thoughts about relying on opaque white to achieve the highest lights are revealed at the end of this section.

The inherent problem with bodycolour however, especially when applied thickly, is its chalky absorbent quality. When working over the top of an area of bodycolour, touches of translucent watercolour will sink into it (and this can be an effect in itself) instead of gliding over the surface. Increasing the amount of gum into the bodycolour or glazing it with the same diluted will minimise the problem and prevent the paint from cracking.

Mistakes in bodycolour are not so easily rectified as they are in transparent watercolour. Ruskin advocated 'Chinese' zinc white to pale watercolour tints, producing bodycolour or 'dead colour', as he called it. He believed success in the medium depended upon the artist having a clear idea of the effect in mind before commencing:

> There is no vehicle or method of colour which admits of alteration or repentance; you must be right at once, or never; and you might as well hope to catch a rifle bullet in your hand, and put it straight, when it was going wrong, as to recover a tint once spoiled.
>
> The secret of all good colour in oil, water or anything else, lies primarily in that sentence spoken to me by Mulready: "Know what you have to do." The process may be a long one, perhaps: you may have to ground with one colour; to touch it with fragments of a second; to crumble a third into the interstices; a fourth

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[34] Townsend, in *Turner's Painting Techniques* (1993:45-46), cites additives found in many eighteenth and nineteenth century pigments, chiefly lead white, barium sulphate, chalk and gypsum. See also "The Materials of JMW Turner Pigments", *Studies in Conservation*, 38 (1993:231-254). In addition, Jo Kirby, in her article *Fading and colour change of Prussian blue, occurrences and early reports* (National Gallery Technical Bulletin no. 14, 1993:62-71) states, "Alumina or other white pigments commonly used as extenders, such as white earths and barium sulphate, could also have been added deliberately" (p67). Ralph Mayer, in *The Artists Handbook* (1991:143-144), comments, "Alumina hydrate is the best and most widely used material for extending transparent pigments, and blanc fixe (barium sulphate) for the heavy opaque ones".

> into the interstices of the third; to glaze the whole with a fifth; and to reinforce in points with a sixth: but whether you have one, or ten, or twenty processes to go through, you must go straight through them knowingly and foreseeingly all the way; and if you get the thing once wrong, there is no hope for you but in washing or scraping boldly down to the white ground and beginning again.[35]

It takes great flair to work opaque touches into transparent areas of watercolour and vice versa; Turner certainly incorporated the above rigour and discipline into his practice. The crucial point to bear in mind is that Turner blended his mediums and techniques almost indistinguishably. Sometimes he would introduce very small amounts of white bodycolour into his watercolour paint and different combinations of them (lead, barium, zinc) in order to achieve the effect in mind.

For example, above and beside the jetty on the bottom left hand side of *The Dark Rigi* (1842) (fig. 2), the interplay of lights reflections, refraction and shadows with the ripples of the water have been depicted with numerous semi-translucent glazes and intricate details stippled and hatched with minute touches of opaque and transparent watercolour.

However Turner did not employ bodycolour in every watercolour he painted; he introduced it only when he saw fit; it was not a prescriptive technique. He was quite prepared to abandon a rigorous chain of processes in order to drive the colours around the paper until they expressed the idea in mind, particularly in the preliminary stages of a work. He would also sponge, scrape, rub and re-soak a picture to achieve effects or to have another shot at the work in hand. Some works received a higher propensity of bodycolour than others: *Prudhoe Castle* (1825) (fig. 18), *Florence* (1827), *Lake Nemi* (1840) (figs. 7 and 11), for example. The series of *Rhine* and *Rome* watercolours (1819),[36] the *Meuse*, *Moselle* and *Loire* (1826)[37] and *Petworth* (1828), among others, are painted

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[35] Ruskin, *The Elements of Drawing* (1971:137-141, Dover).
[36] See Powell (1987:44-49) for more on Turner's use of gouache in Italy.
[37] Wilkinson (1975:81-82).

almost exclusively in bodycolour – the latter two series on a blue-grey sugar paper, a tonal ground which enhances the effect of atmosphere. On the other hand, the twenty watercolours painted for *The Poetical Works of Thomas Campbell* (1837) are produced solely with transparent watercolour paint, dextrously modelled, stippled and hatched, with only the odd touch of bodycolour here and there (see figs. 143 and 144). Many of the above watercolours, including the latter series, are examined in detail in Chapter VIII.

I believe that, as well as the above practices, Turner used numerous jars of bodycolour/gouache paint, set out ready at hand, near the watercolour in progress, when he saw fit. This would enable him to dip into the jars with either brush or pen, rapidly and in succession – his use of the pen can be seen in his 1840s *Swiss series* for example. Since speed and spontaneity were an integral part of his practice, he would not wish to waste too much time preparing bodycolour when in the mood to paint. Many of his watercolours contain broad sweeps, scumbles and multitudinous detail in bodycolour. Whether he prepared these time-saving jars of ready mixed bodycolour – like poster paint in consistency – himself or bought them commercially, is not yet known. It is their contribution to his practice that is crucial, and their constituents, which are outlined in a following section.

The Rev. Henry Trimmer's son recalled the following to Thornbury concerning Turner's use of bodycolour in the oil medium:

> At this early time my father has seen his pictures in progress, and considered that he availed himself largely of body colours. A picture dealer who repaired one of his large pictures, and whose name I forget, told me that Turner came and worked over it with body colours, and then varnished them. As Somerset House I have been told by Howard that he worked over his pictures with body colours, using brushes with very small handles, and painting from little jars.[38]

It seems unlikely that Henry Howard RA would mistake little jars of bodycolour

[38] Thornbury (1877:124).

for anything else. In addition, Elhanan Bickell, business man and whaling entrepreneur, found and rubbed out some watercolour detail with a hanky on the oil painting Whalers, circa 1845, which he had just bought from Turner. Turner refused to do anything about it at first but eventually took it back to alter.[39] There may be dispute about how much Turner incorporated bodycolour in the oil medium[40] but there is more than enough evidence of its use in watercolour.

Having outlined the benefits and some of the difficulties in using the medium, Turner provides a warning:

> During one evening, probably in the late 1840s, he and other artists were discussing the use of opaque white in watercolour as an alternative to creating lights through scraping the paper or leaving it blank.
>
> Turner was generally a reticent talker, but on this occasion he wound up a strong speech by shaking his fist at Harding, Roberts and some others, who were supporting feebly the *convenience* of the vulgarising material in question, and saying quite fiercely "if you fellows continue to use that beastly stuff you will destroy the art of watercolour-painting in our country".[41]

The above appears hypocritical, for Turner certainly used plenty of the "beastly stuff". However not everyone utilised bodycolour with the same flair and subtlety as he.

Turner's death in 1851 broadly marked the demise of the handmade and the increased mechanisation of artist materials, chiefly machine-made paper and paints. Some artists increased the use of bodycolour in an attempt to compensate for the narrower range of tones achievable on machine-made papers, compared to linen rag-based papers. What they appear to have gained is a narrower range of techniques and imagination, whilst Turner's watercolours increasingly became the mark by which others were measured.

Indeed, Bower cites the artist Samuel Palmer (1805-1881) singing the praises of London Board in comparison to modern papers, stating it:

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[39] Hamilton (1997:297).
[40] Thornbury, ibid.; yet after Turner's death, Trimmer's son found no bodycolours in his studio, nor in his half-finished pictures.
[41] Hamilton (1997:295). James Duffield Harding (1797-1863), Member of Old Watercolour Society, David Roberts (1796-1864).

reflects light through the pigments. It shows the full depth of the colours laid on, and as you retouch with more colour the re-touchings are still darker, as one would suppose they naturally must be. *In the modern papers, you come to a full stop at a point far short of the depth of the pigment – in fact it is an ocular paradox.*[42]

Turner's watercolour and oil techniques – some crucial parallels

Watercolour and oil paints may differ in their viscosity, gloss and handling – oil paint is still only watercolour pigment with linseed oil, turpentines, gums, resins and waxes added – technically they have much in common. Both produce transparent paint films whilst opaque bodycolours and gouache narrow the differences further with their texture and covering power. Turner had been painting with watercolour for ten years before he began experimenting with oils in 1793. From his early twenties onwards, the crossover in techniques which had traditionally been ascribed to distinct and separate mediums alarmed many critics. It was yet another indication of his willingness to experiment and break with tradition in order to innovate.

In fact the following techniques and many of those described herein may be recognised in any watercolour or oil Turner produced – in the intricate columns, masonry and foliage of the oil *Dido Building Carthage* (1815) (fig. 100) to the distant hills and details in the watercolours *Florence* (1827) (fig. 7) and *Prudhoe Castle* (1825) (fig. 18). The similarities between the two mediums were recognised by a man who believed Turner was unteachable: Edward Dayes, in his book *Instructions for Drawing and Coloring Landscapes* (1805:300), quoting a Mr Deleval, states:

> Therefore, as all effect of color is by the light made to pass through it, by what he calls transmission, or, in other words, by being reflected back through the color, it must follow that the lighter the ground they are laid on, the brighter and more vivid they must appear. This not only holds good with respect to water-colors, but equally applies to oil, and indeed to all other modes of painting.

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[42] P Bower, "The Oxford Papers", *Studies in British Paper History*, vol. 1 (1996:69).

Fig. 100

Let us remind ourselves that in watercolour painting, light is reflected through the paint from the paper's surface, whilst gouache and oil paint rely on the lights produced by mixing opaque white paint into the other colours. It may well be that Turner attempted to mimic the light reflectant properties of paper when he chose to prime canvases with brilliant white.

Colour beginnings

The next stage in planning out a composition in both mediums often involved the use of colour beginnings. The Rev. Trimmer's son recalled:

> I think he fairly instructed my father in painting in his own method; which was to lay the dead colours as nearly as possible in the forms you wished, leaving as little as possible for finishing using as a vehicle nothing but linseed oil, diluted as required in spirits of turpentine.[43]

Turner often blocked in compositions, in both watercolour and oils, with bright clean colours: yellows, pink reds and blues. These "dead colours" or undercoats varied in opacity and pigment loading from translucent washes to an emulsion-like consistency or even thick buttery textures. As preliminary tints, their colours could reflect through the final layers depending on the amount of finishing and detail Turner felt a picture needed.

Scumbles

Scumbles constitute a thin opaque non-continuous film of paint, often applied semi-dry and through which the undercoat shows through brokenly. It is like an emulsion paint in consistency. Turner describes such paint films as "crumbling layers" in the *Studies* in the Louvre sketchbook (TB LXXII). Crucially they enable light paint to be placed over dark or dark over light and because of their crumbly nature, produce

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[43] Townsend (1993:28).

scintillating broken colour effects. The technique can be seen in the blue distance of the watercolours *Florence* (1827) (fig. 7) and in areas of *Lake Nemi* (1840) (fig. 11).

Glazes

A scumble becomes a glaze if more water or oil is added to make the paint more transparent. Glazes in various degrees of dilution applied in multiple layers – allowing each coat to dry separately – can create effects of luminosity, gradation and recession particularly in skies and distant to foreground topography. The same may be used on masonry, columns, architecture, reflections, shadows and so on. If lain wet on wet, they will produce fluid tones which blend and blur together, like those found in stormy seas and skies.

Glazes are particularly effective when brushed dilute over dry opaque sections of paint, buttery or impasto'd in texture. The paint settles in the textured crevices whilst the prominent areas of the undercoat reflect through the thinnest area of the glaze.

Impastoes

An impasto is a buttery-thick application of paint, ideal for placing light colour over a dark ground or vice versa. If flicked dextrously with a brush to skim the surface of the paper or canvas, details such as trees, dense foliage, vegetation or wisps of cloud in the sky and foam in the sea can be cunningly established. Like scumbles, they often represent the brightest and purest colours in a painting, due to their thickness and texture. Sometimes, especially in oils, impastoed paint thickly applied is scored with a sharp object, the edge of a brush, and once dry the inscribed marks are enhanced with glazes in the manner described above. In both mediums, Turner worked the paint with his fingers,

rag, palette, knife or brush to smear, smudge, blend, dab and rub it in order to create the effect in mind.

Drybrushing

Drybrushing consists of loading a brush with paint then almost drying it on a piece of rag. Using small patient or vigorous brush strokes that lightly skim the surface, a dusty dry colour is left behind. It is eminently suitable for building up dense and homogeneous surfaces by means of many different hues. In addition, crisp, sharp details in the landscape or in architectural forms, figures and so on can be established in this manner. The technique can be found in highly finished watercolours such as *The Dark Rigi* (1842) (fig. 2), *Lake Nemi* (1840) (fig. 11) and oils, including *Dido Building Carthage* (1815) (fig. 100). Drybrushings are sometimes sandwiched between glazes or used singularly as finishing touches.

To collate information, eyewitness accounts and academic data about Turner's materials and techniques are all very well but testing ideas in practice is not only crucial to assess their viability, it is a central part of Turner's legacy few if any have chosen to pursue.

In Turner's watercolours, *The Dark Rigi* (1842) (fig. 2) and other works cited in this thesis, the tints and paint films remain stable when superimposed with further marks, unless he deems it part of an effect, for example in the cloud vapour in front of the Rigi.

Any shift, wash up or disturbance in the undertints during their tonal progression is undesirable and a perennial problem for artists as it will create muddy tones instead of their clear transmission and combined luminosity.

It is well known that Turner studied and absorbed old masters' techniques into his own practice with a view to going one better. In order to decipher how Turner produced an immense tonal range in his watercolours, a crucial test for the underlayers, I proceeded with the following experiments.

Pigments used extensively by Turner throughout his career were used in these experiments. Cobalt blue, due to its granular nature, is notorious for washing up; Prussian blue and madder red are dye-like pigments that afford a transparent contrast; chrome lemon and orange red are semi-opaque; yellow ochre often coarse and gritty. The pigments are mixed with a variety and combination of mediums suggested by colourmen before, during and after Turner's era. The data supplied by Bronwyn Ormsby and Sarah Vallance's analysed samples taken from Turner's watercolours, paints and palettes was also crucial. Throughout, comparisons with Turner watercolours and my own emulations of them informed the progression of the experiments. They are painted on handmade linen rag paper based on those Turner used and are presented in squares and rectangles ranging around 2.5cm x 2.5cm, some slightly larger, others smaller. Each is numbered with an explanation of contents, interspersed with summaries that arrive at a full and comprehensive conclusion.

Experiments

1 The square was resized with a cold solution of isinglass glue, 1 part to 10 water and 10 % alum.[44] The same solution was added 1 brush drop to 5 paint on the palette. Isinglass was reportedly used by Paul Sandby in the late eighteenth

[44] Ludvik Losos, in *Painting Techniques* (1987:46), recommends the following to harden the surface of soft paper: 3-5% isinglass and 10% alum in water; and Field (1835:198) states: "A most excellent mucilage for water-painting may be made by diluting gradually clear size of isinglass with boiling water, till, on becoming cold, it just flows and loses its gelatinous texture: in this liquid is then to be dissolved by gentle heat as much colourless gum Senegal or Arabic, as it will conveniently take up".

century.[45] His ideas, I believe, would have been common currency during Turner's youth at the RA and as such there was merit in exploring their effect or at least minimising the problem of washing up.

2 Repeated the above, employing hot isinglass solution.

3 Another technique attributed to Sandby, 10% gin added to tints.[46]

4 In 1832 Mr J Hammond Jones received The Silver Isis Medal from the Royal Society of Arts for the following: A solution of borax in cold distilled water "in every quart of which is afterwards dissolved a quarter of an ounce of gum tragacanth" dried sufficiently firm to allow tints to be repeatedly laid over one another without moving or washing up. In Hammond's experiment, "the ivory or porcelain plate was covered with 2-3 (coats of) liquor, then a few drops added to the paint when applied.[47]

The above was converted into manageable quantities without any surprising difference when compared to other experiments.

5 Gum tragacanth 1 part to 7 water.

6 Gum arabic 1 part to 7 water with 5% ammonium carbonate (an additive referred to by Barnard in the preparation of gum).[48]

7 Gum senegal 1 part to 7 water.

8 Oxgall 1 part to 2 water glazed over each successive tint of recipe no. 7.

9 Tints without additives, recipe no. 7.

10 Drybrushed cobalt blue occupies the top, a scumble of cobalt the middle. Once dry, stipples and drybrushings of the same colour on top. Prussian blue repeated

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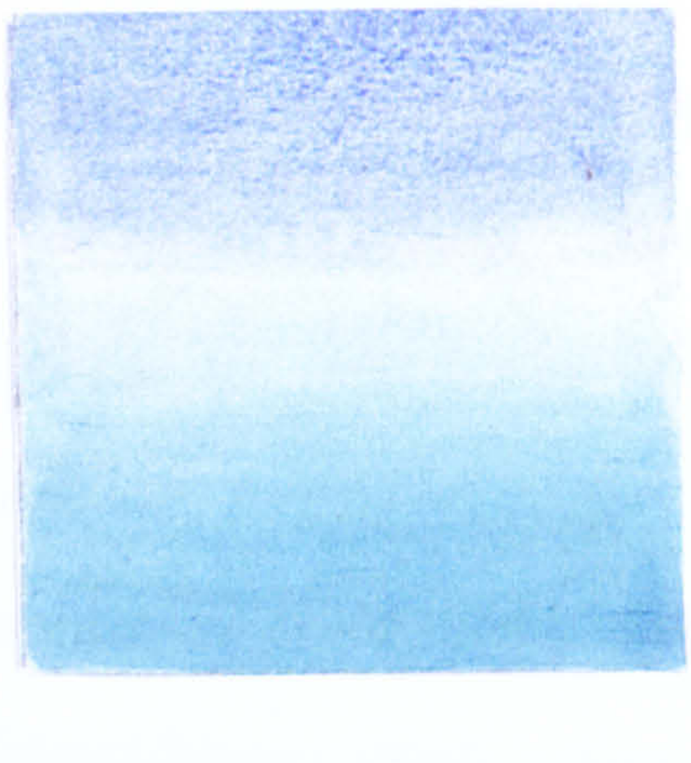
[45] Bernard Brett, *A History of Watercolour* (1984:98-100); Paul Sandby, one of the committee of 24 elected to establish the RA circa 1768.
[46] Ibid.
[47] *Transactions of the Society of Arts* (1832-1838, vol. 49 p30-31).
[48] Barnard (1858:73).

1

2



3

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9

(same techniques) in the bottom of the square, recipe no. 7.

11 Repeated the above with the addition of barium sulphate and approximately 20% gum arabic solution, to prevent absorbency, added to the paint on the palette.

12 Repeats the above utilising lead white in place of barium.

13 Divided into thirds; top band bare paper, middle flat tint of barium sulphate, lead white occupies bottom band, both without gum solution, on top of which are painted extremely diluted bands of cobalt, yellow ochre, madder red, Prussian blue.

14 The top band Chinese zinc white with approximately 30% gum arabic solution; the bottom band lead white with same gum ratio. On top were painted bands of Prussian and cobalt with stipples of the same.

15 5-7 drops of gum arabic solution and ammonium carbonate added to a 1 inch square water vessel. Once the tints were dry they were reinforced with drybrushings and stipples of the same colours with a small amount of lead white added to the paint on the palette.

16 Field, in his *Chromatography* (1835:198) – a work Turner possessed – cites gum ammoniac as "a middle vehicle between oil and water, with some of the advantages of both".[49]

The gum pulverised and left to dissolve 50-50 water for 3 hours, then dissolved 1 part to 7 water as a pigment binder. Although very sticky, it proved to be little different in effect from other samples.

17 Gum ammoniac 1 part to 7 water, repeat of above.

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[49] Field (1835:198) "Ammoniac or Gum Ammoniac, is a gum resin, soluble in spirit and in water, in the latter of which it forms a milky fluid that dries transparent: it has many properties which render it useful in water-painting, and is, we have found, superior to the gums in forming some colours into cakes causing them to work off. It is avoided by insects is very tenacious, and affords a middle vehicle between oil and water, with some of the advantages of both".

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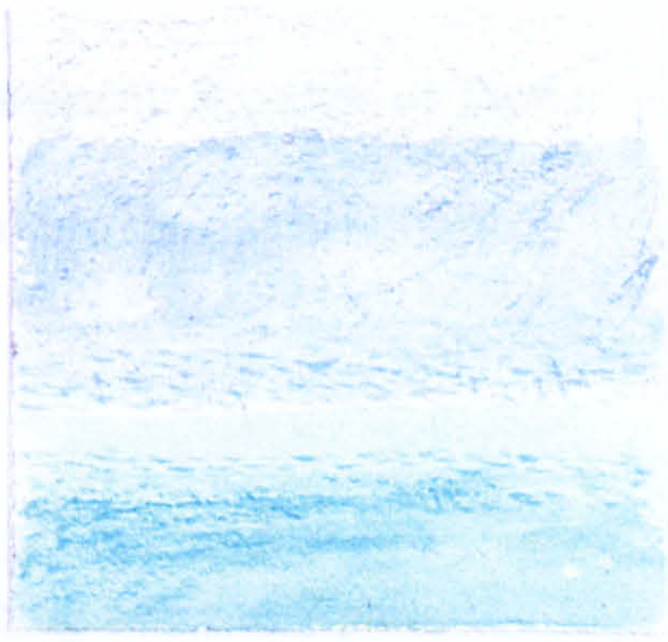

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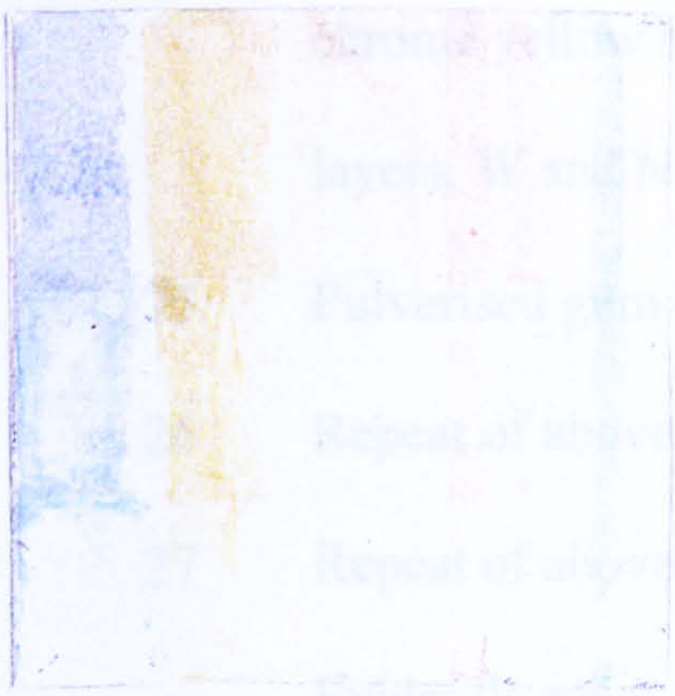

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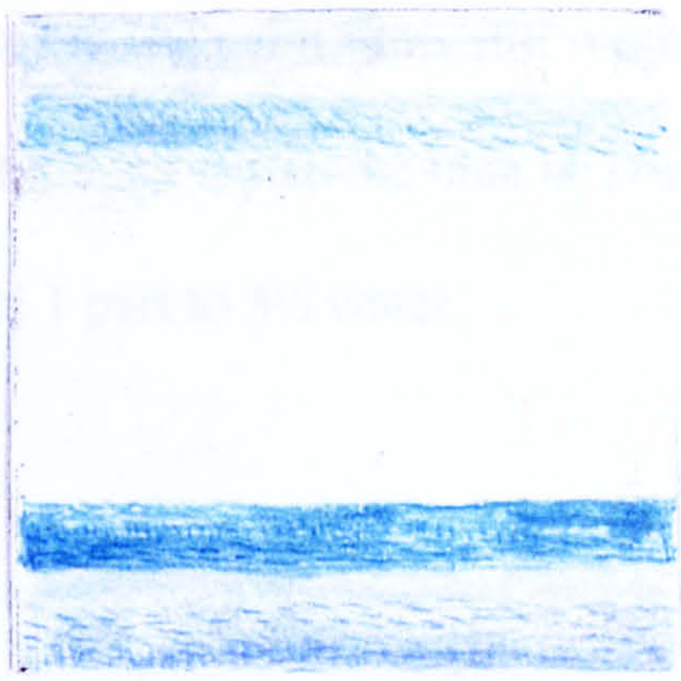

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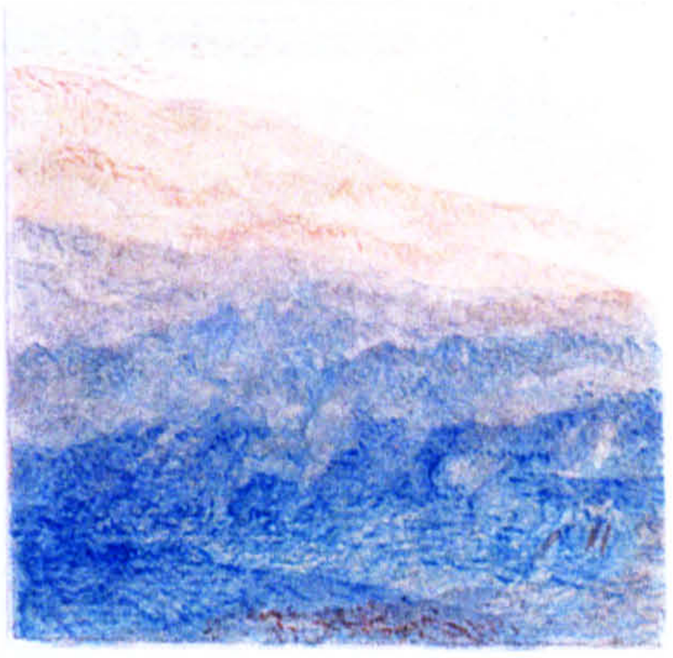

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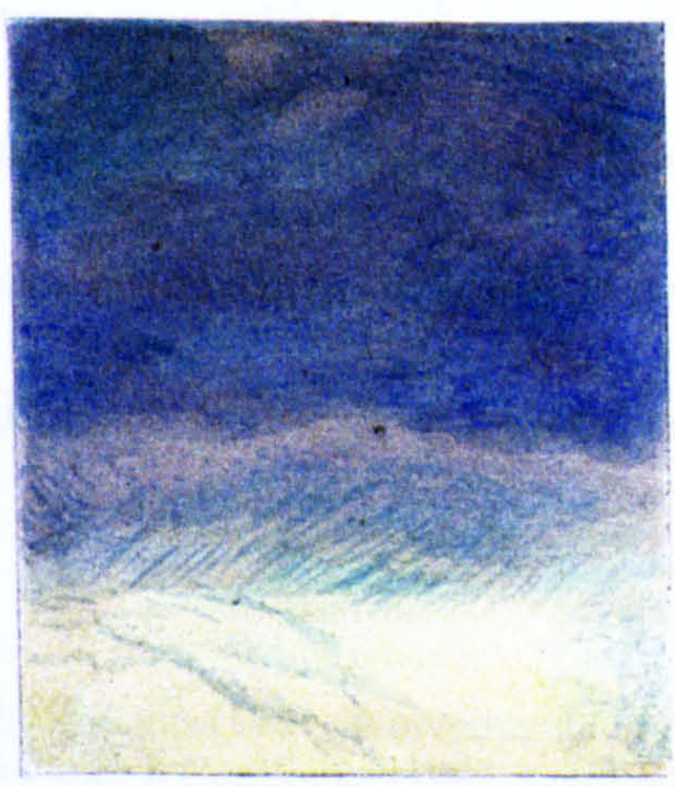

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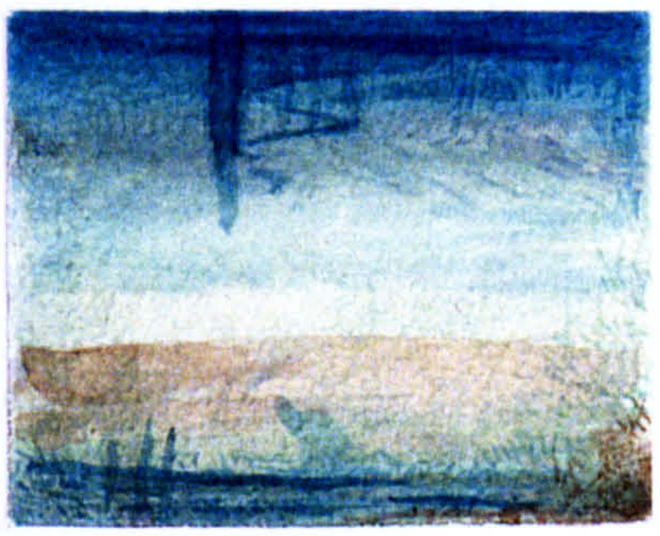

18 Repeat of above.

19 Pulverised gum senegal diluted 1 part to 10 hot water – no sugar candy or honey present – mixed with pigment. Sections of Turner's *The Dark Rigi* (1842) were emulated, with slight improvement in adhesion.

20 Repeat of above.

21 Repeat of above.

22 Repeat of above, reducing water to 7 parts.

23 Repeat of above, reducing water to 7 parts.

24 Winsor and Newton late twentieth century cobalt and vermilion cakes; Rowney chrome yellow moist cake. The paint films still washed up during progressive layers, W and N cobalt did not match the blue in *The Dark Rigi*.

25 Pulverised gum senegal 1 part to 3½ water.

26 Repeat of above.

27 Repeat of above.

Evidently many artists found other uses for gum arabic than a soluble binder for watercolour cakes. Two watercolourists and admirers of Turner, William Henry Hunt (1790-1864)[50] and Miles Birket Foster (1825-1899), [51] (who possessed some Turner watercolours)[52] employed Chinese zinc white with a generous admixture of gum arabic to produce a hard unabsorbent enamel-like priming on which to work (see number 14).

Hunt believed such a priming made his colours "bear out" and "almost rival Nature herself".[53] Foster's unfinished works show he made detailed pencil drawings,

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[50] For more on Hunt see *Catalogue* by T Jones (1981, Wolverhampton Art Gallery, *William Henry Hunt 1790-1864*) and J Witt, *Life and Work with a Catalogue* (1982, London).
[51] For more on Foster, see Jan Reynolds, *Birket Foster* (1984, BT Batsford Ltd) and HM Cundall, *Birket Foster RWS* (1906, A and C Black Ltd, London).
[52] TS vol. 8 no. 1 p41-45.
[53] HM Cundall, *A History of British Watercolour Painting* (1929:59, Batsford, London); and Hardie, vol. III p108; see below.

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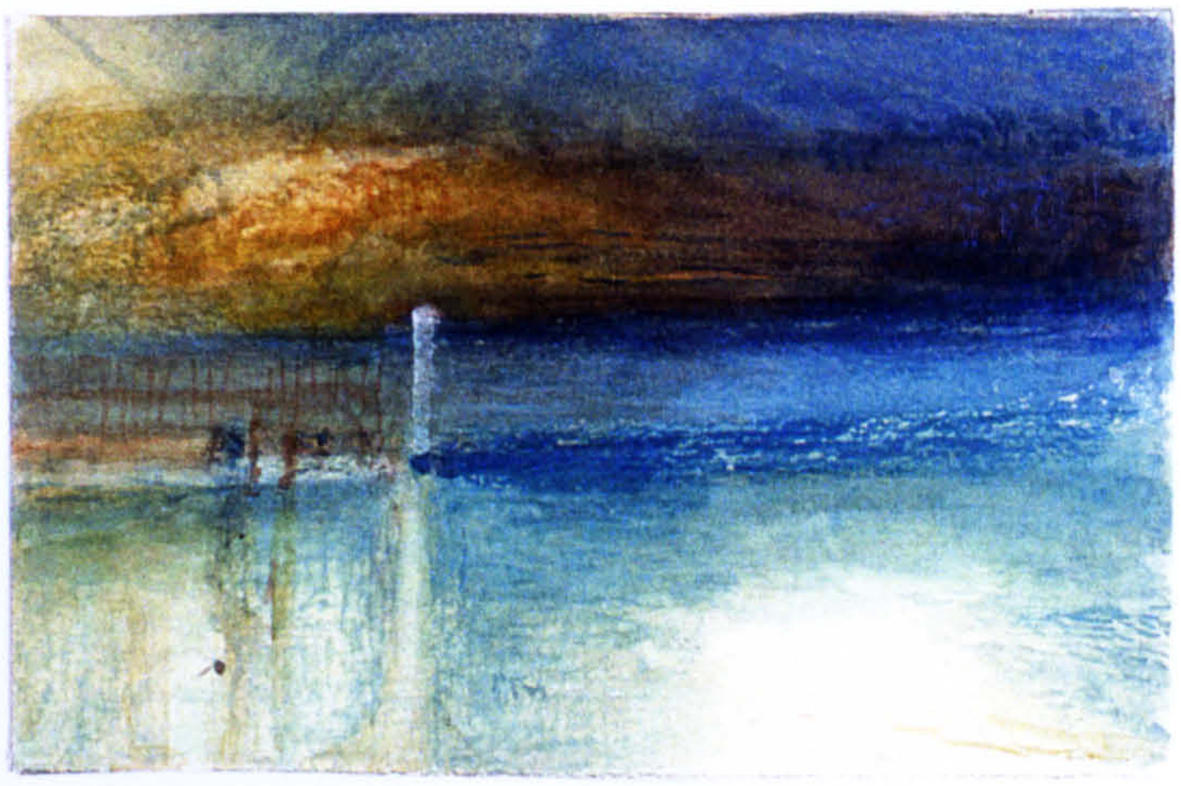

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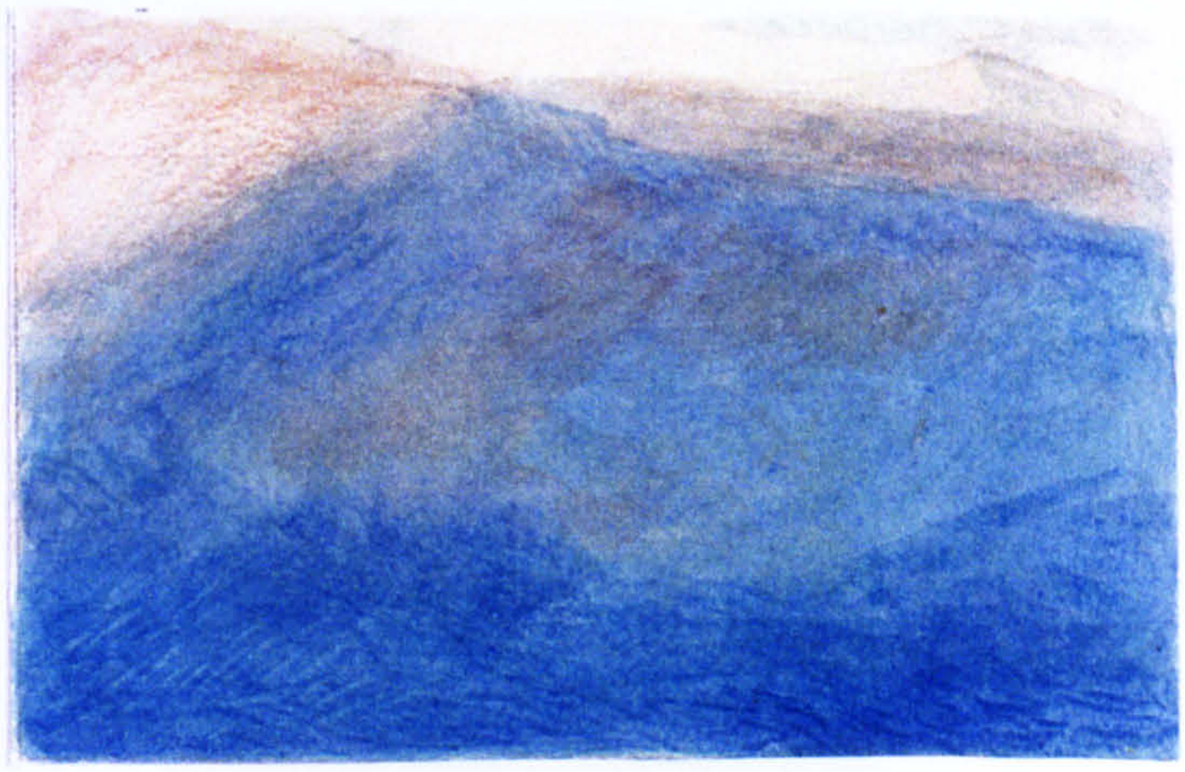

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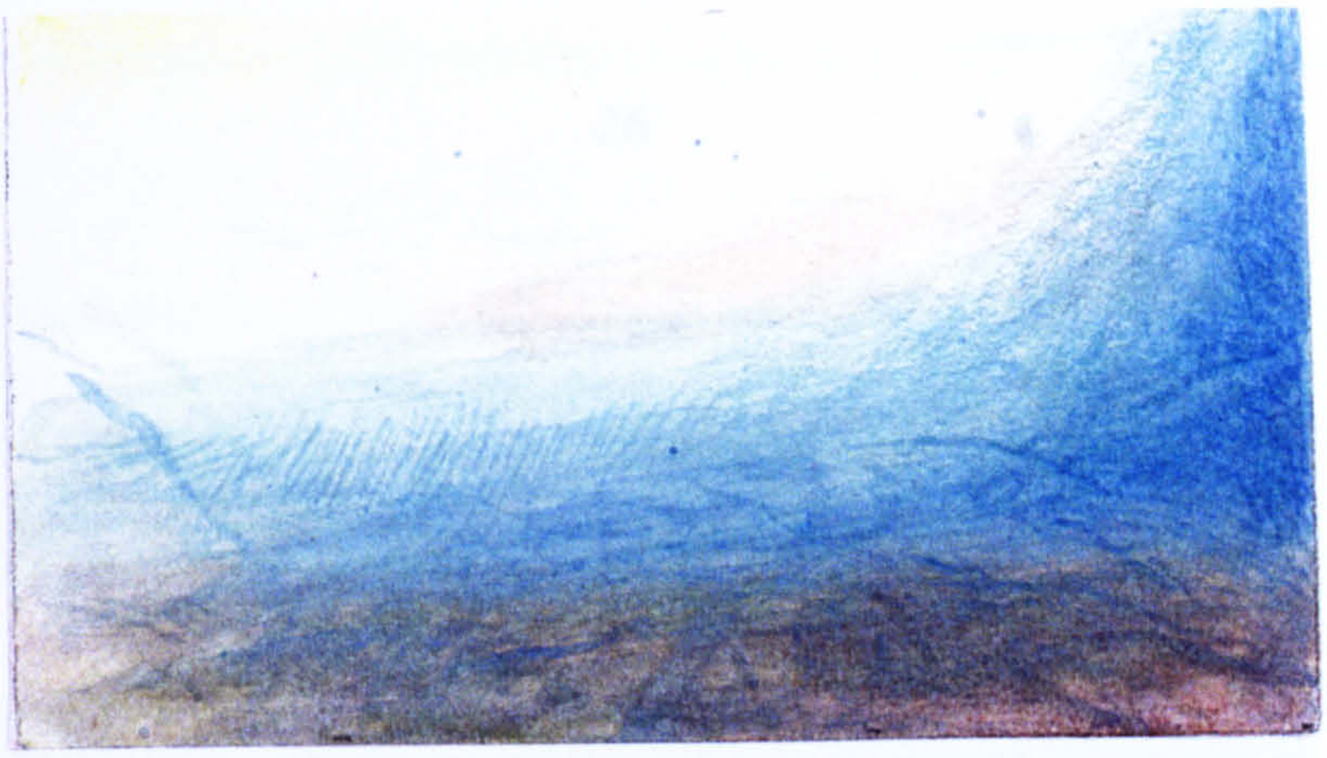

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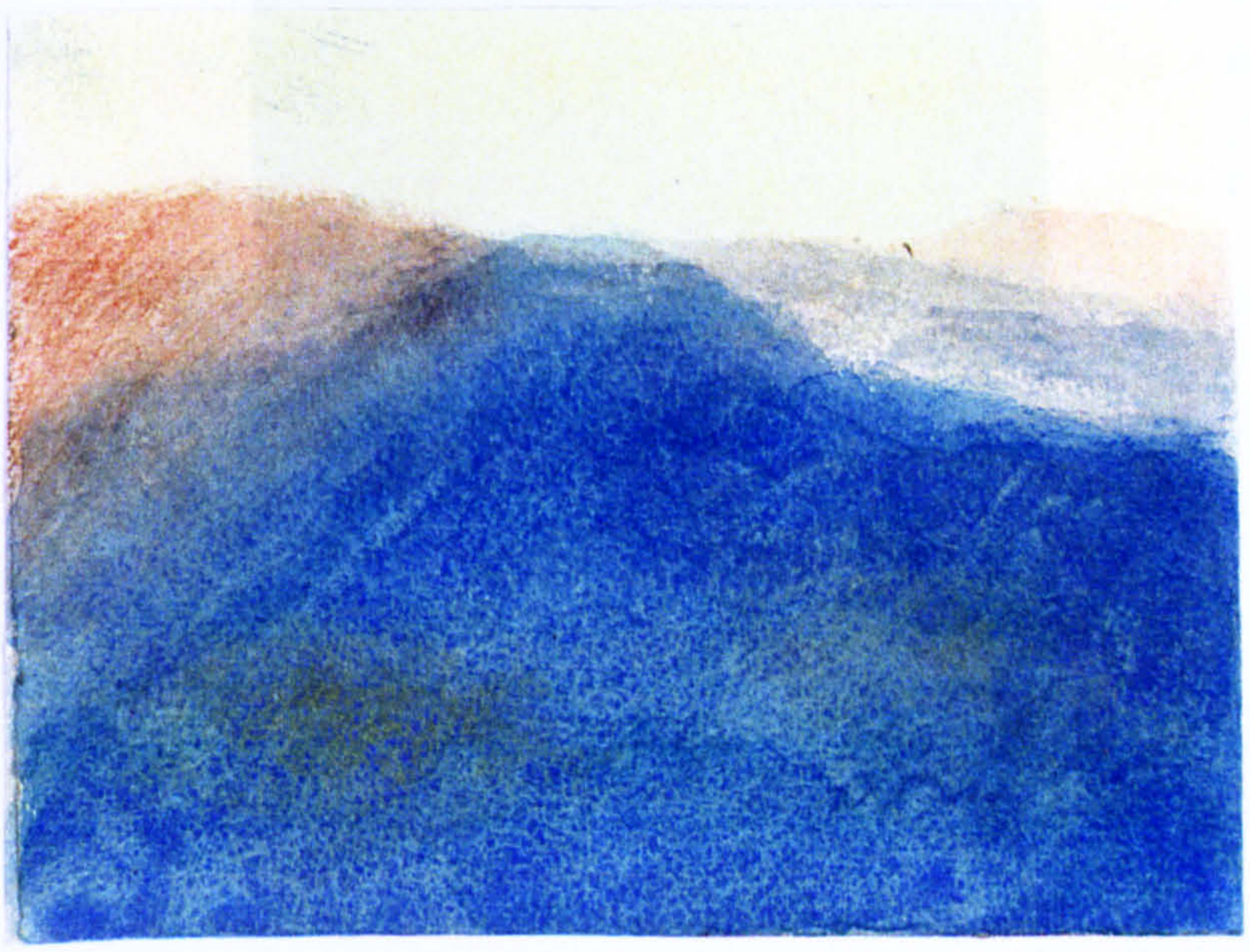

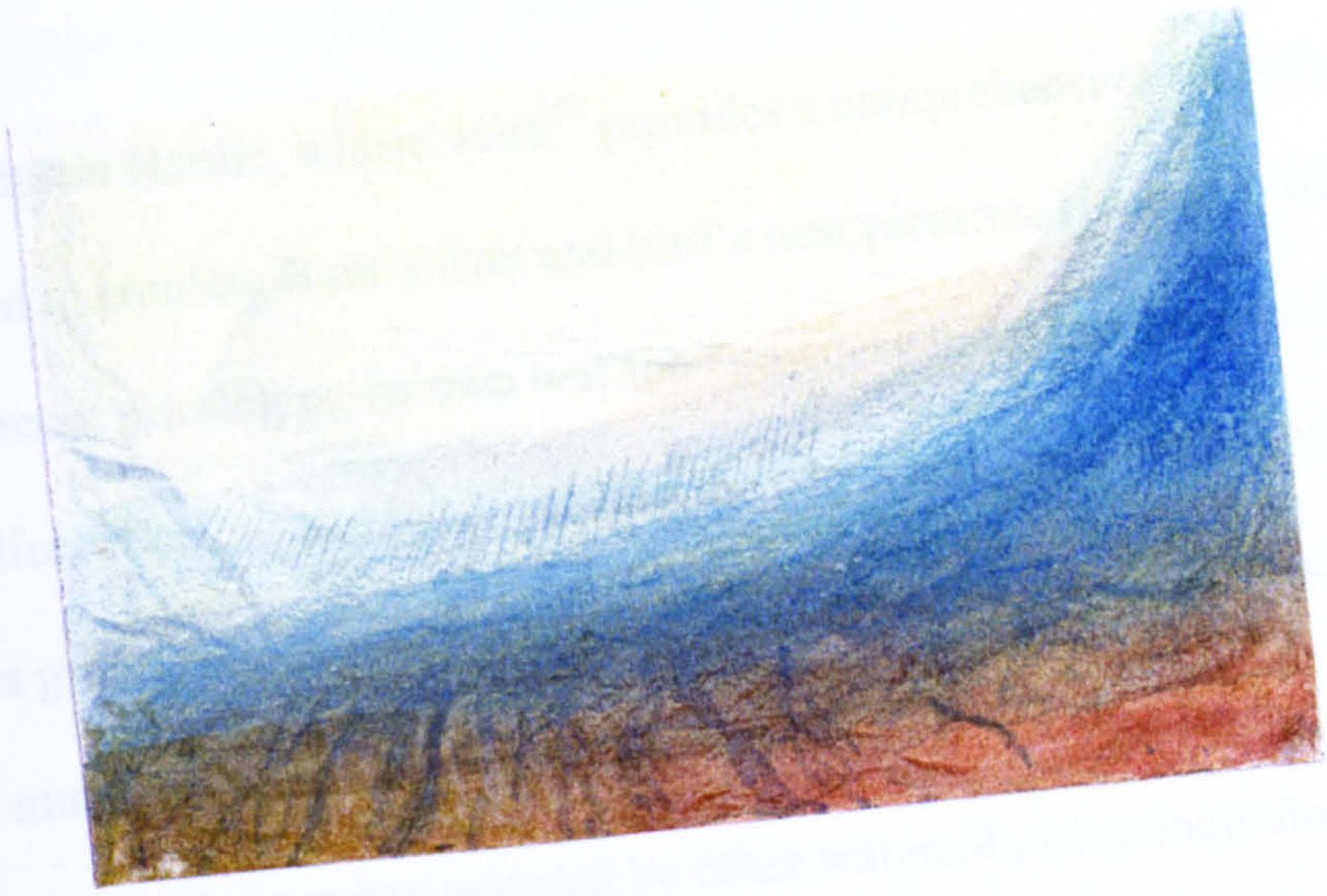

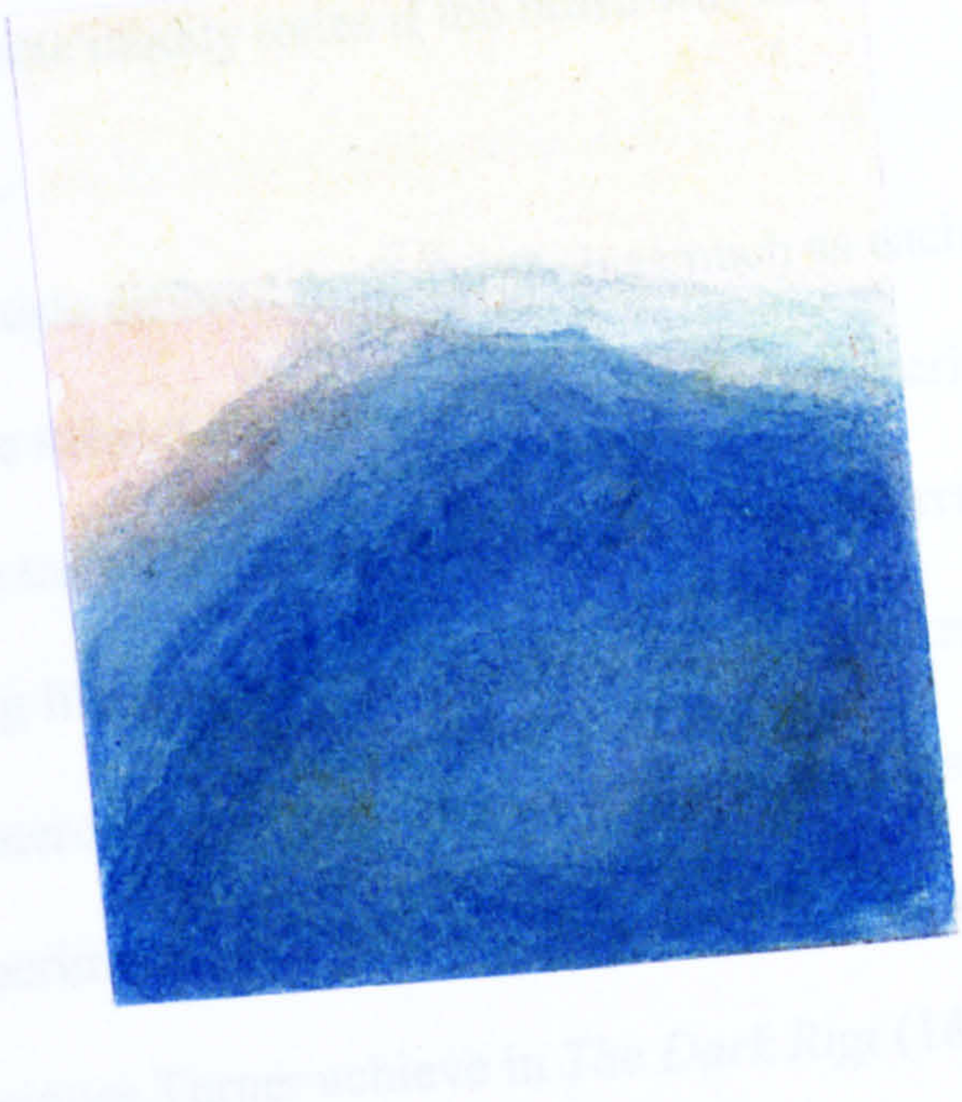

covered some parts with watercolour washes and other areas with solid patches of Chinese zinc white.[54] Like Turner, it is reported that he "worked with his brush as dry as it well could be and probably no artist in the medium of watercolour used so little water".[55]

Martin Hardie, whose work[56] provides a comprehensive survey of the subject, attempted to emulate Hunt's fruit and bird's nest pictures. He found that Chinese white as an undercoat priming on its own was too "powdery in texture became disturbed by the application of colour and tended to blur the edges and made the colour mat". However laying a ground of Chinese white mixed with plentiful gum enabled colour to be applied on top much "more readily in stipple or in wash".[57]

The technique was adopted by other watercolourists including JF Lewis (1805-1876), Samuel Palmer and many pre-Raphaelites. However it was still a water soluble medium and just as liable to wash up (ie. lift from the paper's surface instead of firmly adhering to it) and create muddy tones if the brush was not wielded with sufficient skill, care and deliberation.

The above artists differed from Turner inasmuch as each had their own tastes but their techniques, like subject matter, could tend towards prescription whilst Turner "swerved off all the tracks he had established, dazzling and irritating his contemporaries. All through his long life he was experimenting, adjusting, altering, probing new possibilities for watercolour without any consciousness of his ultimate objective".[58]

So far, experiments with gum arabic, senegal and ammoniac based paints to replicate the techniques Turner achieve in *The Dark Rigi* (1842) (fig. 2) and other works,

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[54] Cundall, ibid. (1906:125-126) and Reynolds, ibid. (1984:71).
[55] Cundall, ibid.
[56] Martin Hardie, *Watercolour Painting in Britain*, vol. I, "The Eighteenth Century" (1966, London), vol. II, "The Romantic Period", (1967); vol. III "The Victorian Period" (1967).
[57] Hardie, ibid. vol. III p108.
[58] Hardie, vol. II p42.

proved disappointing. The colours of the pigments used were not a problem but the texture and tone of the paint films needed more accurate matching.

For example the chrome lemon sky and areas of the lake in *The Dark Rigi* had a flat, matt appearance, indicative I believed of a trace of gum tragacanth. Yet other areas of paint had a glassier, enamel-like appearance, a characteristic of cherry gum (see below). Although gum arabic as a singular binder had proved disappointing, it could not be totally ruled out of the picture.

Additives such as honey, sugar and glycerine could, especially if used in too high a proportion, make successive tints wash up and disturb undercoats, thereby creating muddy tones. This would make them unsuitable for Turner's complex and often vigorous techniques in the medium. Commercial cakes which Turner (and other artists) used contained these additives though often in small, trace and controlled amounts, and obviously they could be mixed with other water soluble gum mediums and paints of both the artists and colourmens' preparations. In addition, Turner, or other artists, could add sugar candy and honey to their own gum preparations as they saw fit, which makes for a complex range of possibilities.

Whilst continuing to experiment with a whole range of eighteenth, nineteenth and twentieth century colourmens and artists preparations for pigment binding mediums, I showed Bronwyn Ormsby (Northumbria University, School of Conservation, PhD research William Blake's (1757-1827) gum analysis) the results. Ormsby drew my attention to Sarah Vallance's PhD thesis, *The Development and Application of Chromatographic Techniques in the Characterisation of Artists Media* (1977, Northumbria University). Vallance had chromatographically analysed a range of artists

media,[59] including three watercolours by Turner:[60] *The Bridge and Goats* (1806-1807), *Mount Pilatus from Lake Lucerne* (c1844) (fig. 101) and *Lake Lucerne, looking from Kussnacht towards the Bernese Alps* (1845) – the latter two works especially sharing techniques found in *The Dark Rigi* (1842), among others in the *Swiss series*.

Vallance's analysis revealed that the principal binders in Turner's watercolour paint from these samples contained a mixture of gums tragacanth and karaya (karaya, or Indian tragacanth, is very similar to tragacanth in that it swells in water, though is less soluble and more acidic) though she conceded that there were some unidentifiable sugars present.[61]

Crucially since the samples taken were from stained fibres, this signified the paint had been employed for establishing dilute washes as well as for more opaque areas. Due to the large gap in years between the 1806-1807 watercolour and the 1845s, the above appeared to be a recurrent medium in Turner's work. In addition Vallance had also found traces of cherry and other gums in a range of artists' works.[62] Turner was aware of gum tragacanth and its preparation he referred to it in his writings on artists' materials and chemistry notes contained in a sketchbook circa 1808.[63] It is probable that he learnt of his benefits from fellow artists, students, lecturers during his youth at Munro's studio, the RA or by word of mouth from colourmen suppliers. What is surprising is that the medium receives scant if any attention in colourmens' books, manuals and treatises before, during and after Turner's era. The fact that tragacanth/karaya gums are approximately four to five times more expensive than arabic or senegal, even at today's prices (£10 to £2.50

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[59] In collaboration with the Tate Gallery, London.
[60] See Vallance 1997:109, 151, 152, 159, 161, 165, 166.
[61] Personal communication. See also a key work on gum characteristics and analysis, CL Mantell, *The Water Soluble Gums* (1947, Rheinhold Pub., USA (OOP).
[62] Such as William Blake.
[63] TS N 1992:7.

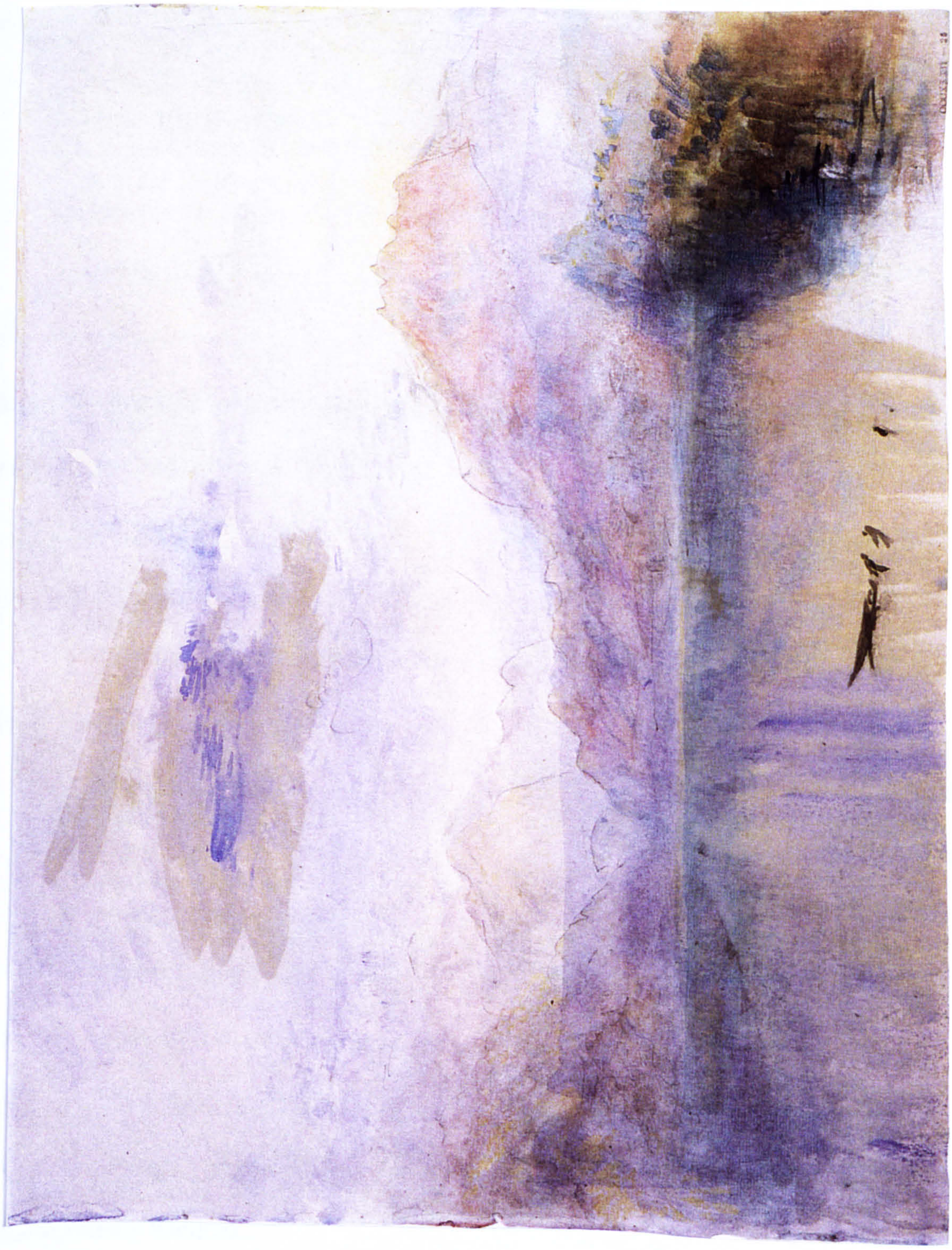

Fig. 101

respectively for 100g), perhaps influenced their omission as a mainstream pigment binder.

The colourman philosopher George Field, in his *Chromatography* (1835:198), comments:

> Tragacanth is a strong colourless gum, soluble in hot water, and of excellent use when colours are required to lie flat or not bear out with gloss and also when a gelatinous texture of the vehicle is of use to preserve the touch of the pencil and prevent the flowing of some colours; for which purpose also solution of isinglass is available, and of greater power.

An earlier treatise by M Constant De Massoul, *A Treatise on the Art of Painting and the Composition of Colours* (1797:223, London), notes of gum tragacanth, "It is used to give body to powdery substances". This is perhaps one of the clearest connections we have for its use in the preparation of bodycolours/gouache.

Maria Bazzi, in her book, *The Artist's Methods and Materials* (1960:110), cites the ancient Egyptians' use of tragacanth and honey as a pigment binder.

> However the most compelling reference to gum tragacanth can be found in D V Thompson's *The Materials and Techniques of Medieval Painting* (1956:58, Dover):
>
> > Used by itself, there is not really enough of the gum in a workable mixture to bind the colours securely but it was used in mixed temperas, blended with other gums. "You can't use it by itself", says Valentin Boltz, "but it's quite nice when you mix it with other gums, and gives fine light tones". V Boltz von Ruffach, *Illuminirbuch*, sixteenth century, Germany.
>
> As for cherry gum, Max Doerner, in *The Materials of the Artist* (1977:222-223, Granada pub.), states: "Cherry gum absorbs much water. About ten% of the gum is enough to form a thick solution"... and it "gives to colour great transparency and a vitreous character ... it approaches enamel in effect, has great brilliance and is at the same time very easily handled...".

Cherry gum is simple to prepare, 1 part to 10 water being a flexible ratio to work around; using hot water to dissolve it is suggested in one recipe.[64] However finding suitable grades can be a problem, as gums gathered from trees in moist weather will obviously be less concentrated than the dry material and this should be taken into consideration when any exact formulae are being followed.

Cherry almond gum features in the next batch of experiments, but a more useful and adhesive grade of cherry gum from the south of France informs later experiments.

Both tragacanth and karaya gums dissolve in water to form a wall paper type paste. 1 part (a level teaspoon was used throughout) to 20 water produces a thick strong mucilage. One source recommends the mixing of 1 part to 10 water initially then add the remaining 10 parts of water.[65] The solution may be left for 24 hours to assist solubility. Field suggested using hot water to dissolve the gum.[66] Dr Douglas Anderson (Chemistry Department, Edinburgh University), an expert in the field, questioned whether heat had any impact on the gum's adhesive character.[67]

After much trial and error, I found 1 part gum tragacanth (or karaya) to 10 cold water to be effective; it is this ratio that informs the following experiments:

Experiments (continued)

28 50/50 tragacanth/karaya solution mixed 1 part to 1 part pigment.

29 Repeat of the above, adding a further 4 parts water to solution.

30 Repeat of the above, with 7 parts water. All three experiments producing overtly gummy, starch-like and pasty results.

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[64] See Ralph Mayer, *The Artist's Handbook* (third edition 1981:394-395, Faber and Faber).
[65] Jonathon Stephensan, *The Materials and Techniques of Painting* (1997:51).
[66] Field (1835:198).
[67] Personal communication. Doreen Wissart (Development Consultant, Red Carnation Gums, UK) suggested boiling for five to ten minutes as it is believed in industry to be necessary to obtain the full benefit of the gum tragacanth.

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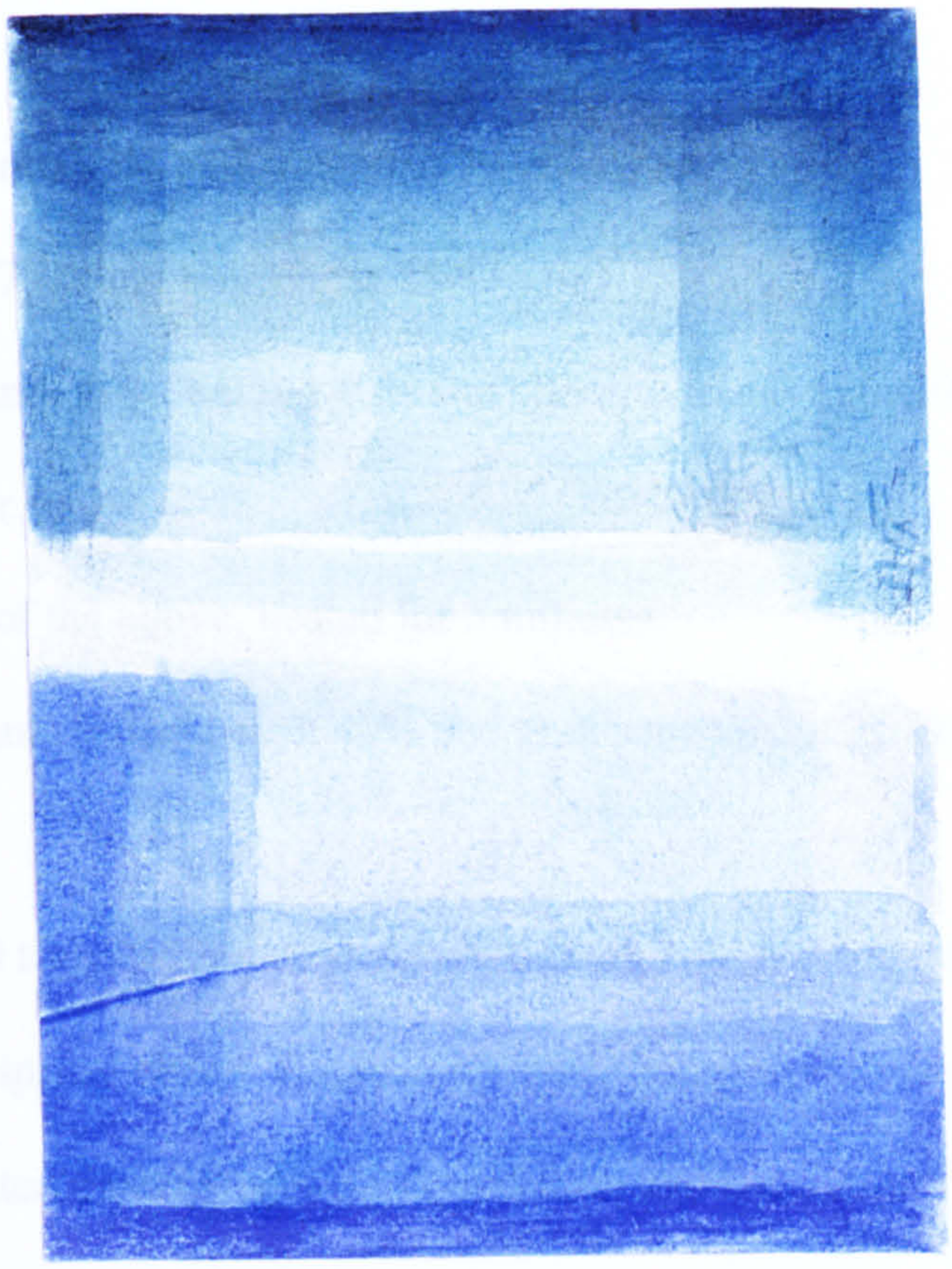

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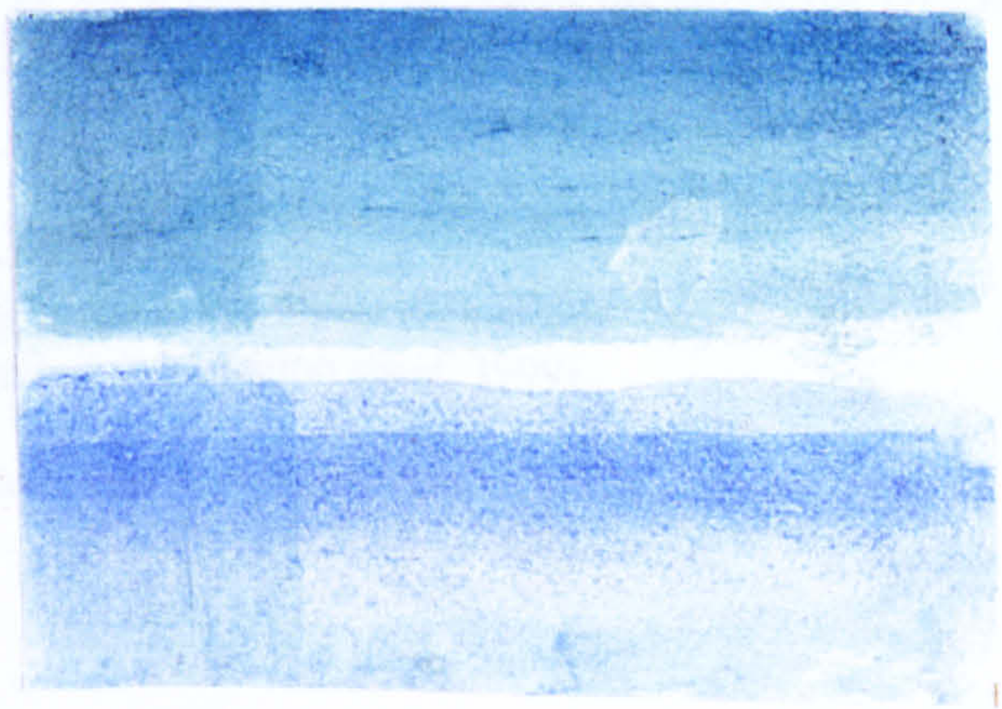

31 Tragacanth 75% and karaya 25%.

32 Karaya 75% and tragacanth 25%.

33 Tragacanth 40%, karaya 40% and cherry almond gum 20%, itself diluted 1 part to 10 water.

34 Repeat of the above, heated for 5 minutes.

35 Tragacanth 40%, karaya 40% and gum senegal 20% (itself diluted 1 part to 3 parts water).

A 50/50 tragacanth-karaya solution produces an inert, starchy ultra matt paint film which will not spread easily. Karaya especially being slightly acidic remains partly insoluble in water, causing particle flocculation and spearation[68] (see watercolour study, fig. 102).

Tragacanth is the dominant operative; karaya may have been added by colourmen to bulk out tragacanth during Turner's era.[69]

The crucial discovery here is that the addition of acacia's arabic/senegal and cherry gum to tragacanth or karaya reduces their surfaced tension and turns the thick mucilage into a fluid liquor conducive for mixing with pigment. The evidence can be seen in experimental composition fig. 103 which was painted using a tragacanth 75%, karaya 15%, arabic gum 10% ratio.

Note: Heating the solution in the second cherry gum sample (number 34) appeared to make little if any difference to its characteristic.

One recipe in the *Roberson Archive*[70] suggests a watercolour megilp consisting of "1oz tragacanth to 1P (x-24oz) boiling water on stove for two hours then strained through

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[68] Kirk Othmer, *Encyclopedia of Chemical Technology* (vol. 10, 1966:747, Alland and Robert, "Gommes et Resines Naturelles" product information sheet, 1999).
[69] Mayer 1981:395.
[70] Hamilton Kerr Institute, Cambridge (431), 9.10.1861.

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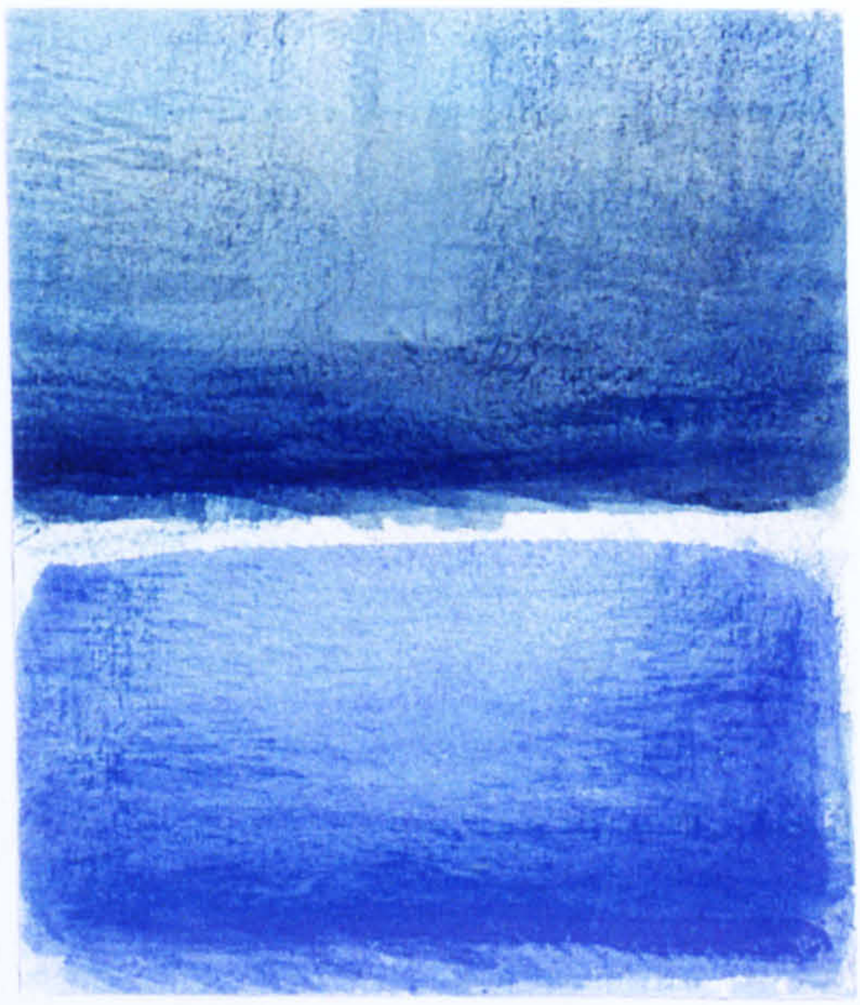

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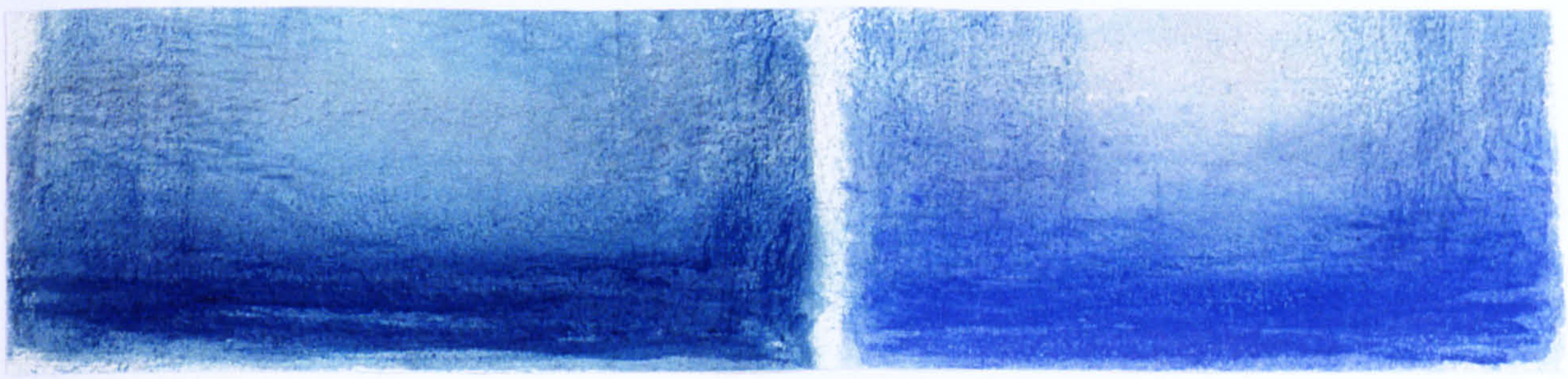

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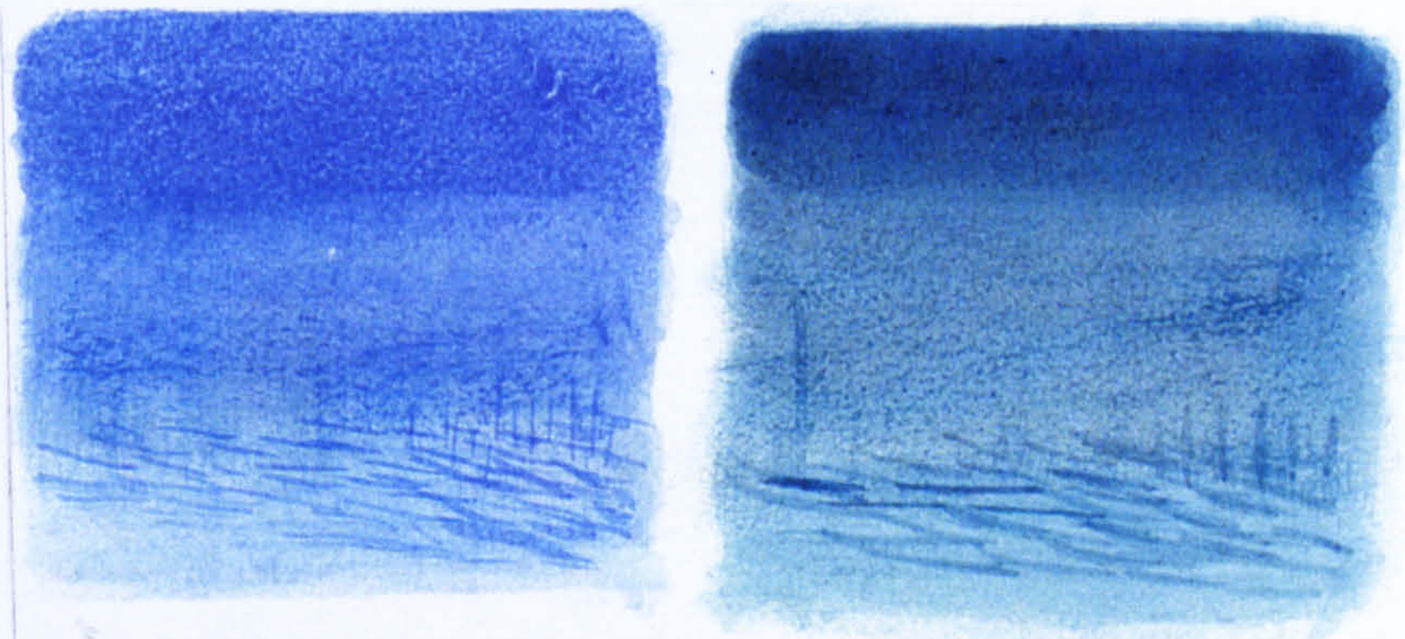

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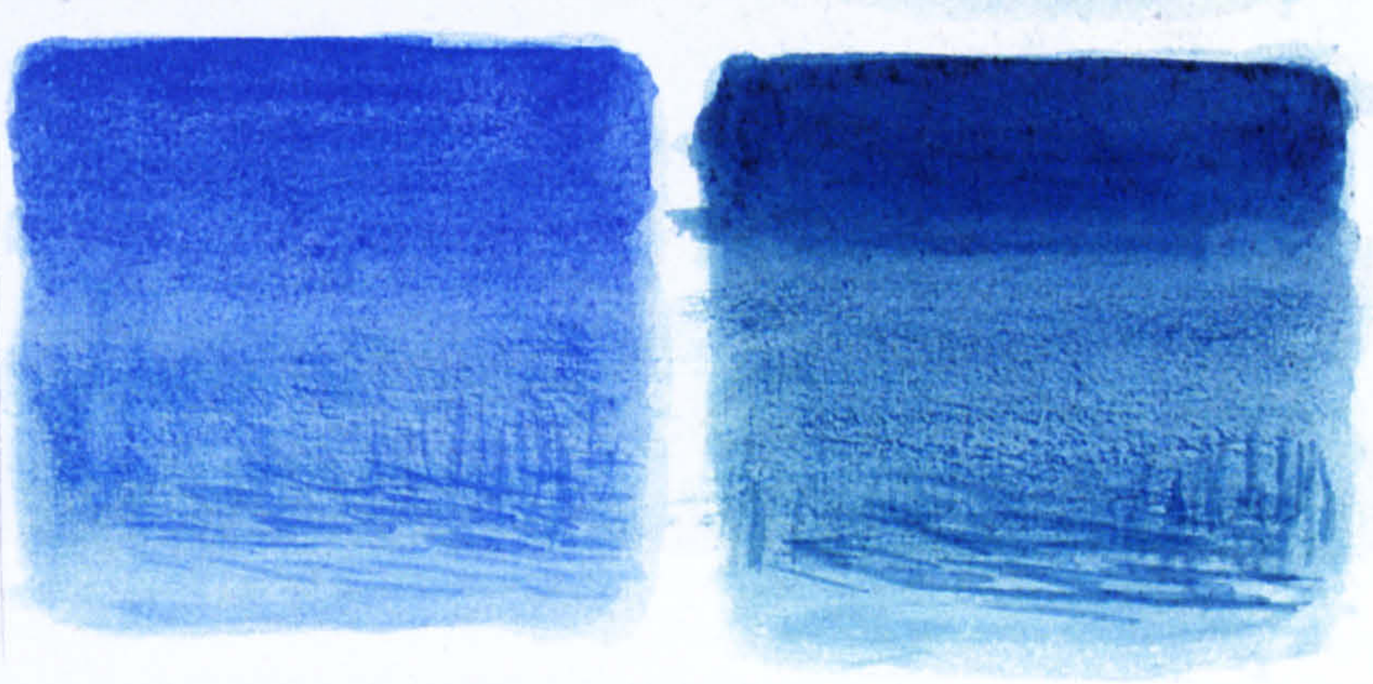

Fig. 102

muslin, add 2oz Prepared Gum Arabic and place on stove again for three to four hours well stirred".

36 The above was converted into manageable proportions, 1 part (teaspoon) tragacanth, incorporating karaya 10%, to 20 parts water, boiled for 20 minutes, adding 2 (teaspoons) of prepared gum arabic boiling for a further 30 minutes.

37 The above repeated boiling for 5 minutes only.

38 A gum arabic 50%, tragacanth/karaya solution 50%.

39 Repeat of above with 3 brush drops of gin and a pinch of alum. There were no surprising visual differences caused by lengthening boiling or the additives cited.

Sarcocolla

Sarcocolla, a gum resin which originates in the Middle East and, like tragacanth, a member of the Astragalus family, promised to be extremely interesting. Indeed, the colourist George Field mistook the two gums for one and the same in the shops during the 1790s.[71]

Sarcocolla first came to my attention in Hilaire Hiler's *Notes on the Technique of Painting* (1969:230-231, London). The recipe Hiler cites can be found in full in JG Vibert's *The Science of Painting* (1892:157-159,London). He states:

> Sarcocol, about 50 grammes, according to quantity desired. Treated by alcohol of 96 degrees, boiling until all boiled away. The distilled alcohol leaves a red residue, soft, looking like turpentine. This residue still contains much alcohol, and is dried in a stove at from 70 to 80 degrees with much difficulty; this is the Sarcocolline, of which there will be 35 grammes. Sarcocolline is soluble in water, except a very small proportion which dissolves in sulphuric ether. The watery solution, treated by a solution of acetate of lead, forms a scanty precipitate which

[71] Dr Leslie Caryle (Canadian Conservation Institute, Ottawa, Canada), personal communication notes CL Eastlake's *Materials for a History of Oil Painting* (vol. 1, 1847:549) "The assumed identity of the sarcocolla of Pliny with gum tragacanth rests on the authority of Dr John, Die Malerei der Allen, Berlin (1836:210)"; in George Field's copy of Eastlake he adds, "I compared the articles so called in the shops, more than 50 years ago – and thought they were the same." See also *Oxford English Dictionary* (1989) for fascinating citations under sarcocolla and AP Laurie, *Greek and Roman Methods of Painting* (1910:4, 5, 26, 27) refers to the use of both gums tragacanth and sarcocolla by painters and physicians in antiquity.

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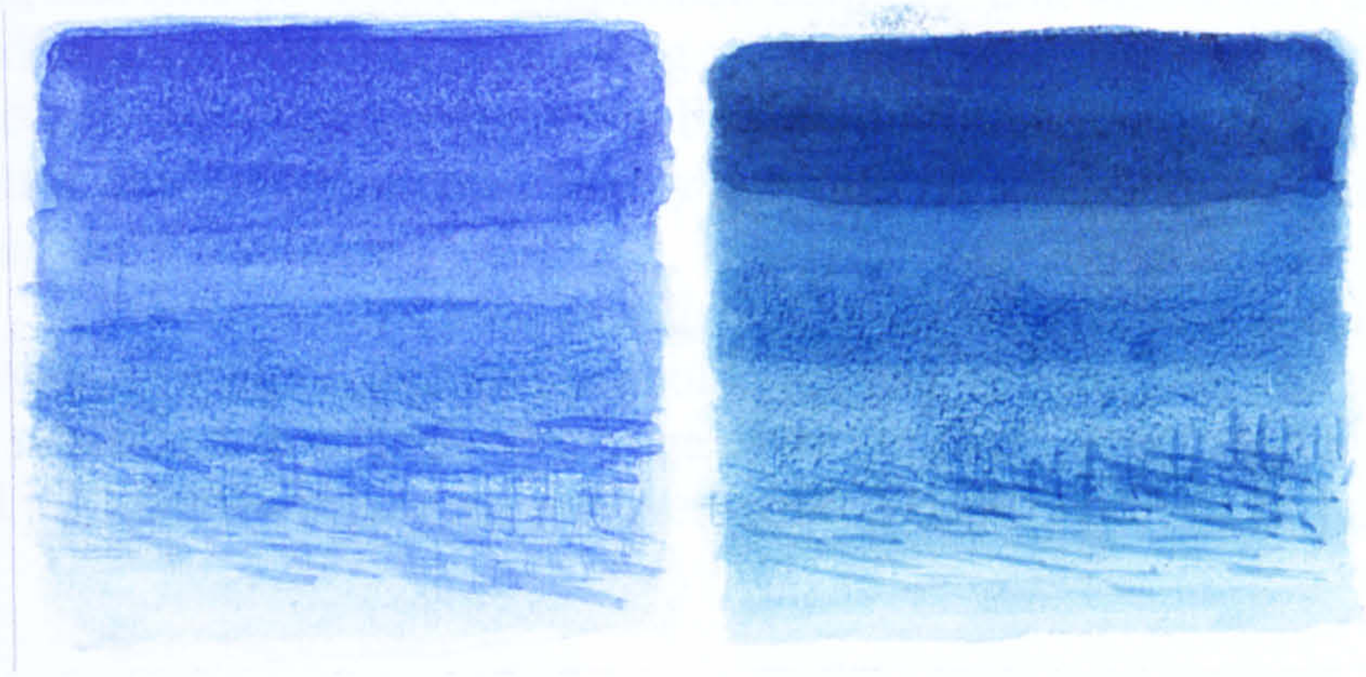

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is separated by filtration, and the liquid is treated with sulphur. To eliminate the lead, this filtered liquid is evaporated until dry, and thus a very slightly coloured production is obtained, preserving all the properties of sarcocolline. It is a glucoxide in which a resin is combined with the elements of sugar. The alum and acetate of aluminium considerably diminish its solubility without rendering it completely insoluble.

Practically one may be satisfied to put the sarcocol in solution in boiling alcohol. The liquor allowed to cool is filtered, and may be whitened by leaving it for some time in contact with bone black exposed to great light, filtered afresh, and the solution preserved in a well-corked bottle exposed to light.

And

> Colours ground with sarcocolline, which acts like a gum, are of an extraordinary richness and colouring intensity. They have the advantage of softening much less quickly than those ground with gum, consequently allowing glazing over water body-colours, and rendering the superimposition of tints much easier.

In addition Vibert claims "By this means painting in watercolours may be done over foundations painted in oil." Such has been speculated with some of Turner's work, a process Henry Howard reports to have witnessed – further experiments are necessary to test this claim.

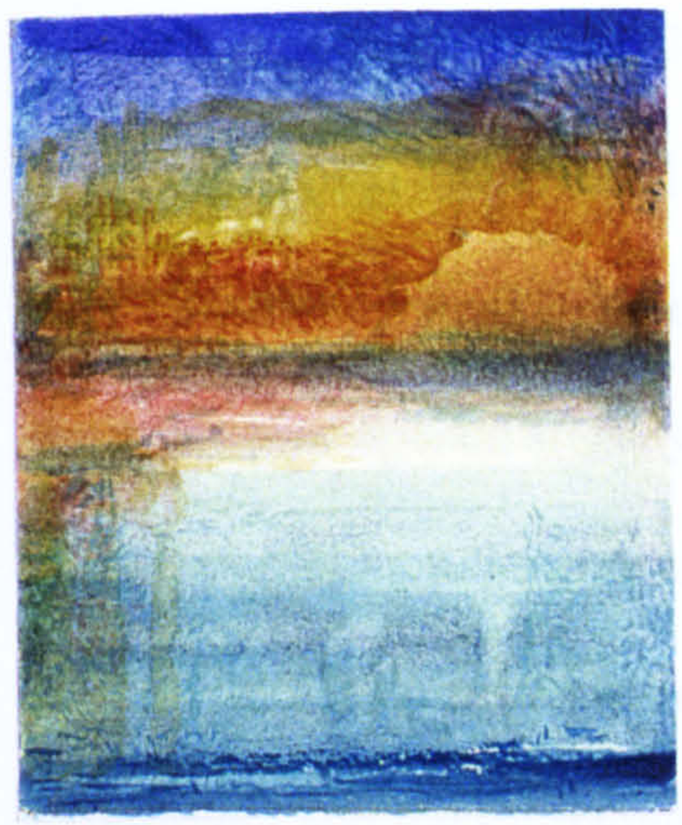
An experiment with sarcocolla

After much searching I obtained a large amount of sarcocolla from Nazareth, Israel, with the help of Dr Efraim Lev, (University of Ramat Gan, Israel) who is studying the medicinal properties of this and other gums used in ancient medicine onwards. Using Vibert's simple preparation as a guide, I proceeded as follows.

40A A ¼ teaspoon of sarcocolla boiled in a small metal pot containing twice the amount of alcohol (gin) for 5 minutes, then mixed with pigment. (Ormsby's sample of Sarcocolla, from India/Persia, approximately 120 years old, supplier Kew Gardens.)

40B Repeat of above but with more painted details.

40a



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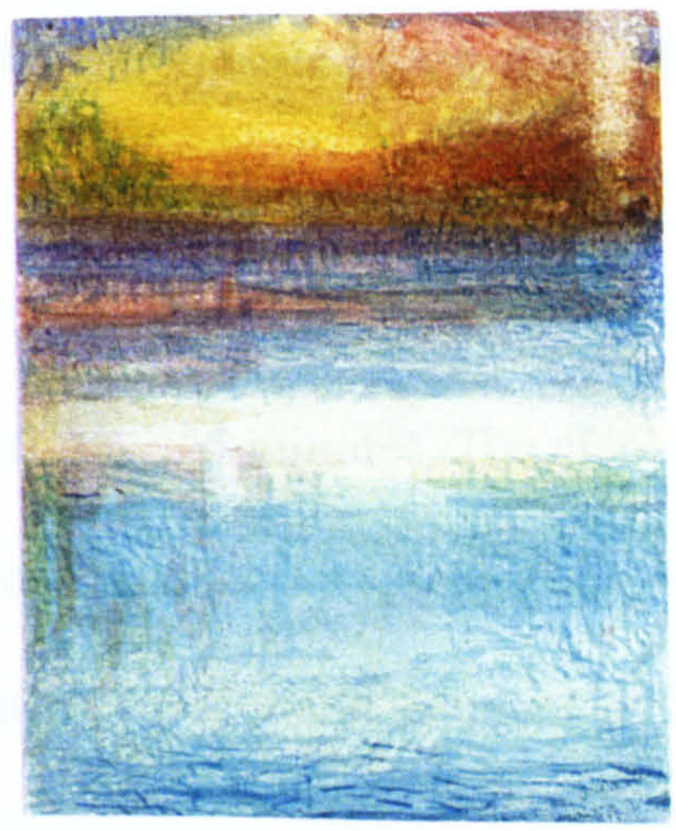

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40 3 teaspoons of sarcocolla to 3 teaspoons gin, boiled for 5 minutes, stirred to sauce-like consistency, then poured into a small tin foil dish and placed in a pre-heated over (gas mark 4 for 5 minutes) for 30 minutes once the gas was turned off, and the oven door opened slightly for a further 25 minutes. The alcohol evaporated, the sample took on the appearance of a small crisp sponge; this was powdered, mixed with water, pigment and painted. (Sarcocolla supplied by Dr Lev, in this experiment and the following).

41 A repeat of the above using less gin (2 teaspoons) was also successful, - a whole range of different combinations and ratios of gum to alcohol were tried – using more gin produced brittle paint films.

Colours ground with sarcocolline were more intense and rich in tone when compared with many of the above samples, but unfortunately still washed up when a wet paint brush was applied to the dry paint film.

Further experimentation using Vibert's recommendation of acetate of lead and its subsequent filtration may provide the tougher paint films he describes. Its identification with tragacanth and availability during Turner's lifetime in colourmen suppliers proves that sarcocolla could still play an important role in understanding eighteenth and nineteenth century pigment binders, whether used singularly or in combination with other gums.

Chromatographic analysis by Ormsby confirms sarcocolla has a high glucose content displayed as a peak in on the graph (see fig. 115). We know that gums tragacanth/karaya are extremely inert as pigment binders until the addition of acacias arabic/senegal or honey/sugar, and, because of its high glucose content sarcocolla will also serve in this capacity. The following illustrate the best of a whole range of

experiments using different ratios of sarcocolline with other gums, whilst some other examples are cited later.

43 A sarcocolla 50% and gum arabic 50% mix, appeared unsatisfactory.

44 A sarcocolla 50% and tragacanth 50% spread easily and produced delicate tints which matched areas in *The Dark Rigi* (1842) (fig. 2).

45 Sarcocolla 50% and karaya 50%.

46 Sarcocolla 30%, tragacanth 40%, karaya 30% – similar to areas in *The Dark Rigi*.

47 Sarcocolla 25%, karaya 75% spread easily with good tints and did not wash or wet up too easily once dry.

48 Sarcocolla 75%, karaya 25% also spread easily and produced transparent paint films that matched areas of the "Dark Rigi" but such a high propensity of sarcocolla whether added to tragacanth or karaya facilitates the washing and wetting up of dry paint films.

On 11 April 2000, I compared further samples and experiments involving combinations of gums, resins and pigments, including the above with Turner's *The Dark Rigi* (1842) (fig. 2) in the storeroom of the Laing Gallery, Newcastle.

The earlier monochrome samples of pure tragacanth, karaya and their mixtures (numbers 28 to 35) displayed some of the characteristics of the paint media used in *The Dark Rigi* but certainly not enough to be conclusive.

However sections of experimental composition fig. 103 painted with tragacanth 75%, karaya 15% and gum arabic 10% matched more closely areas of *The Dark Rigi*, as did some of the above experiments with tragacanth/karaya and sarcocolla. The next three examples proved less convincing.

49 Pure honey – far too brittle for paint films if used solely as a binder (used as an additive by many colourmen).

45

46

47

48

49

50

51

Fig. 103

50 Honey 30% and tragacanth 70% – starch-like, brittle, did not flow too well from the brush.

51 Tragacanth 50%, karaya 30% and isinglass 20% – did not flow well off the brush.

Gums ghatti, guar and locust bean, dissolved 1 part to 10 water mixed singularly with pigment then with 20% arabic added were extremely disappointing and warrant no illustration here.

Turner paint samples

In December 1999, it was possible for Bronwyn Ormsby to GCMS analyse samples from watercolour palettes and boxes (including one whose cakes were stamped with the name of the colourman Sherborn) belonging to Turner, provided by the Royal Academy, the Ashmolean Museum, Oxford, and a private owner.

The minute paint sample is dissolved in alcohol and injected into the GCMS machine. This filters it to reveal a spectrum of sugars inherent in the sample – the abundance of each are displayed and numbered as peaks in a graph.

In addition, samples from the edges of Turner's watercolours *Venice from Fusina* (1840) (fig. 39) and *The Funeral of Sir Thomas Lawrence* (1830) (fig. 38, Tate Gallery, London) were also GCMS analysed in July 2000. The results are listed in Ormsby's table (fig. 104).

To date twenty three samples from Turner's watercolour paints and paintings have been analysed including the four gouache stains from the edges of Turner watercolours by Vallance. Vallance believed these samples contained gums tragacanth and karaya though conceded there were also some unidentified sugars present. However Vallance had omitted arabic from the equation in these samples, and as my experiments have shown

GUM ANALYSIS VIA GC-MS

TURNER WATER-COLOUR SAMPLES

TURNER RESULTS - all run on TIC or SIM

SAMPLE	Institution	No:	SOURCE	PIGMENT	GUM? + sugar/honey
LO1754	Private	1	Travelling w-c pall - private, n.d.	yellow ochre	Arabic + karaya? + min sugar
LO1754	Private	2	Travelling w-c pall - private, n.d.	sienna shade	Arabic + karaya? + min sugar
LO1754	Private	3	Travelling w-c pall - private, n.d.	vermilion/red lead	Arabic + karaya + min sugar
LO1754	Private	4	Travelling w-c pall - private, n.d.	pink red	Arabic + karaya? + maj sugar
LO1138	Ashmolean	1	Trav, china, w-c pall - Ashmol, n.d	vermilion shade	Arabic + min sugar
LO1138	Ashmolean	2	Trav, china, w-c pall - Ashmol, n.d	olive green	Arabic + karaya? + tce sugar
RAPTBLK	Royal Ac	black	Black, ceramic pallete - date?	black	Arabic + tce/min sugar
RAPTBRN	Royal Ac	brown	Brown, ceramic palette - date?	brown	Arabic + trace sugar
RAPTRED	Royal Ac	red	Red, ceramic palette - date?	red	Arabic + karaya? + min sugar
RATWCB25	Royal Ac	25	w-c box, date?	gamboge	Arabic + trace sugar
RATWCB1	Royal Ac	1	w-c box, date?	carmine	Arabic + karaya? + tce sugar
RATWCB30	Royal Ac	30	w-c box, date?	unidentified	Arabic + tce sugar
RATWCB5	Royal Ac	5	w-c box, date?	vermilion	Arabic + cherry/trag + tce sugar
RATWCB2728	Royal Ac	27-28	w-c box, date?	deep crimson	Arabic + cherry/trag + tce sugar
D32162	Tate	1	Venice from Fusina - 1828	Dark ochre	Arabic + Tragacanth + Sugar + Cherry? Sarc?
D25467	Tate	1	Funeral of Sir Thomas Lawrence, 1830	Dark brown	Arabic + Trag/Cherry + Small Sugar
D25467	Tate	2	Funeral of Sir Thomas Lawrence, 1830	Yellow	Arabic + Tragacanth + Cherry? Sarc? + Sugar/Honey
D25467	Tate	3	Funeral of Sir Thomas Lawrence, 1830	Prussian Blue	Arabic + Tragacanth + Karaya? Cherry? + Sugar/Honey
D25467	Tate	4	Funeral of Sir Thomas Lawrence, 1830	Black	Arabic + Tragacanth + Cherry? Sarc? + Sugar/Honey

NB: The presence of karaya gum is being investiagetd further. It is possible that there is no karaya present. The high rhamnose levels may be in gum arabic.

Bronwyn Ormsby
24.2.2000

tragacanth and karaya gums on their own or combined are too inert and starch-like to produce workable paint films without the addition of acacias arabic or its relatives. Ormsby's analysis had improved upon Vallance's research methods. The fact that many of these gums share common sugars as components, such as arabinose, rhamnose, galactose and so on, whilst other such as xylose are peculiar to specific gums ie. tragacanth, cherry, sarcocolla, helped to indicate some and eliminate others in the Turner paint samples – Ormsby's table (fig 105) proving immensely helpful to the layman.

From nine samples taken from Turner's watercolour palettes – and here the opportunity presents itself for introducing gum mediums into the paint mix, as one palette particularly looked glossy – all had a high proportion of arabic and traces of sugar/honey in varying amount. Six however seemingly contained karaya gum but this was not as definite as the other components.

The five samples taken from commercial watercolour cakes stamped Sherborn (established 1780, took James Tillyer as partner 1835, this box dates circa late 1830s, early 1840s) one cake is natural gamboge yellow, one unidentified, all contain arabic and sugar/honey traces, whilst three reds, vermilion, deep crimson and carmine contain cherry and tragacanth as well as arabic and the latter seemingly traces of karaya.

Out of nine gouache samples taken from the edges of Turner watercolours, (including Vallances four samples) all contained arabic and tragacanth, five also contained cherry gum, whilst Vallance believed her four samples contained karaya as well as tragacanth and arabic.

In addition from a box of Reeves watercolour paints (circa 1800), twenty three samples were analysed by Ormsby, including a bottle of watercolour medium (see fig. 93). All contained arabic, five were gamboge based and therefore contained arabinose naturally. From the remaining eighteen, seven apparently contained karaya, six cherry

RESULTS COMPARISON - VALLANCE AND ORMSBY

Relative abundance of sugars in gums

RESULTS - SUGAR COMPOSITION AND RELATIVE ABUNDANCE - VALLANCE / ORMSBY.																
	Vallance	Ormsby	Vallance	Ormsby	Vallance	Ormsby	Ormsby	Vallance	Ormsby	Vallance	Ormsby	Vallance	Ormsby	Vallance	Ormsby	Ormsby
Sugar Component	Arabic	Arabic	Ghatti	Ghatti	Trag	Trag	Sarcocolla	Cherry	Cherry	Karaya	Karaya	Guar	Guar	LBG	LBG	Tam'nd
Arabinose	major	maj/mod	major	major	major	maj/mod	minor	major	major		trace	trace	trace	trace	trace/min	min/maj
Rhamnose	minor	mod/min/tce	minor	min/tce			trace/none			moderate	mod/maj					
Galactose	major	maj/mod	major	mod/min	moderate	mod/min/tce	minor	moderate	mod/min	major	major	moderate	moderate	moderate	maj/	maj/mod/
Mannose								trace	trace			major	major	major	mod/min	trace
Fucose				tce/none	minor	min/tce										
Xylose					moderate	maj/mod/min/tce	minor/tce	minor	min/tce							maj/trace
Glucose		?		tce/none	trace	maj/mod/min/tce	major				tce/none	trace	trace	trace	tce/min/mod	mod/min
Galacturonic acid				tce/none	moderate	tce/none				major	trace					
Glucuronic acid	moderate	trace/none	trace	none				minor	?	minor	none					
Fructose																
Unknown	major		minor		moderate	mod/min/tce	trace	moderate	?	major	min/tce	minor	trace	minor	min/tce	md/mn/mj/tc

* Fucose = Gum Tragacanth
* Mannose = Cherry Gum or Guar/Locust
* Xylose = Tragacanth, Cherry, Sarcocolla, Tamarind
* Rhamnose = Arabic, Karaya

Fig. 105

Bronwyn Ormsby
Dec 1999

gum, four karaya and cherry, the bottle of medium, cherry and tragacanth, fifteen had traces of sugar.

However graphs do not paint pictures. Once the results of the chromatographs of the Turner paint samples were analysed, studied and compared, it was possible for me to attempt to match the results with my own gum mixtures, experiments and paint samples by:

i Raising or lowering by degrees – 10%, 15%, 25% and so on – of the various gums suggested by GCMS analysis.

ii Observing their behaviour in combination when mixed with pigment and painted on paper – different pigments may affect the gum's character and vice versa.

iii Noting how they produce ultra transparent paint films, tints in the mid tonal range, opacities, and painterly touches such as stipple and hatching.

iv Considering how the gum/pigment mix spread and flowed on the paper, whether smoothly or dragging, or if it dried fast or slow thus affecting the speed of practice and sense of immediacy central to Turner's practice.

v Once dry, I returned with a wet brush to test the strength of the paint films and their propensity to wash up.

vi Comparing the same painted samples with Turner watercolours such as *The Dark Rigi* (1842) (fig. 2).

In addition the experiments help determine,

vii If samples of gouache/bodycolour stains taken from Turner works also contain traces of transparent watercolour paint beneath it or gum mediums which could have been added to either on the palette before application.

viii Variances that may exist in the colourman's preparations, the sources of gums, or Turner's own recipes.

ix If other substances were present in the Turner paint samples, I believe that after these experiments their influence, if any, could safely be taken in context pending future research.

x Ormsby GCMS analysed a selection of the following experiments in order to understand further the gums effects on paint media and techniques.

Gas chromatograph – mass spectrometry graphs

The GCMS graphs may be read in broad terms from left to right in sections divided into thirds. Here, the first third often displays high peaks of arabinose and rhamnose. The middle third often contains more dense and complex information about the sugars, if present, such as xylose, fucose, mannose, galactose, rhamnose, arabinose and glucose. In the final third we can find, more often than not, peaks of glucose and galactose.

Samples of Turner's watercolour paint

Fig. 106) A sample of black watercolour paint taken from Turner's palette, containing a high proportion of arabic and trace sugar.

Fig. 107) A sample of dark ochre watercolour paint (possibly gouache/bodycolour) taken from Turner's *Venice from Fusina* (1840) (see fig. 39) containing arabic, tragacanth, cherry gums and trace sugar.

Fig. 108) A sample of dark brown paint (possibly gouache/bodycolour) taken from Turner's *Funeral of Sir Thomas Lawrence* (1830) (see fig. 38) containing arabic, tragacanth, cherry gums and trace sugar.

Fig. 109) A sample of yellow paint (possibly gouache/bodycolour) taken from the same work containing arabic, tragacanth, cherry gums and trace sugar.

Compare with 80? to get Turner palette.
Closest to its chemistry

LATER

```
File          : C:\HPCHEM\1\DATA\SUGARS\TURNBL-3.D
Operator      : Bronwyn
Acquired      :  6 Dec 99    5:22 am using AcqMethod SUGAR2
Instrument    :   GCD Plus
Sample Name: Turner black - repeat. SIM + 73.00
Misc Info     : Three days sitting.
Vial Number: 1
```

ARABIC + SUGAR.

? ↑ 10% Sugar
↓ 50% Sugar

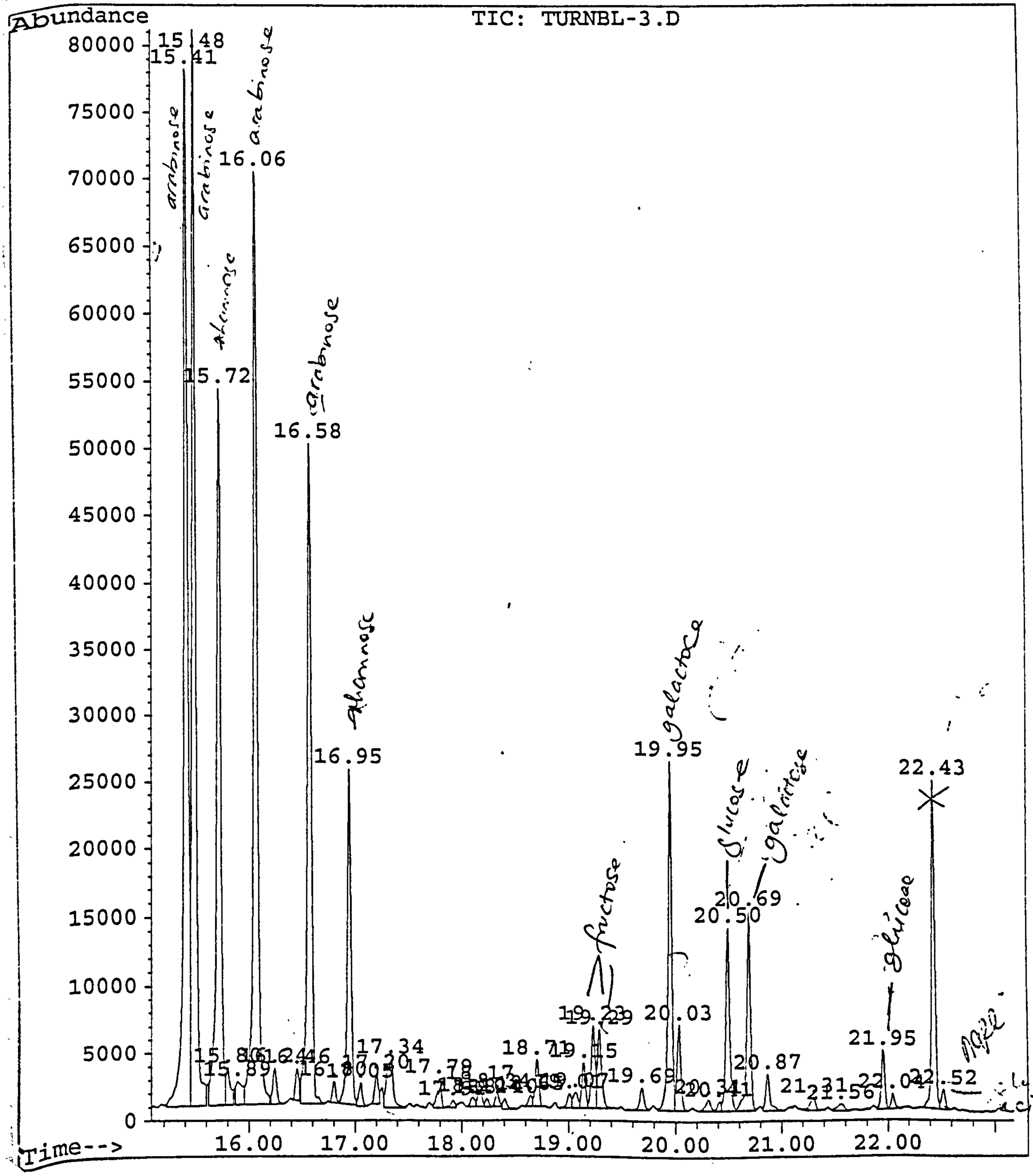


Fig. 106

184D Venice From Fusina

Provisionally P.S. (Trag + Karaya run through together and Peak up as an Arabic??? Cluster) Arabic + Trag + Karaya Candy Sugar (Cherry?)

Could still be Sarrocolla Cos got same Peaks as Tragacanth.

File : C:\HPCHEM\1\DATA\SUGARS\D32162S1.D
Operator : Bronwyn
Acquired : 6 Jul 100 2:12 am using AcqMethod SUGAR5
Instrument : GCD Plus
Sample Name: Turner - D32162, sample 1
Misc Info : After HMDS run.
Vial Number: 1

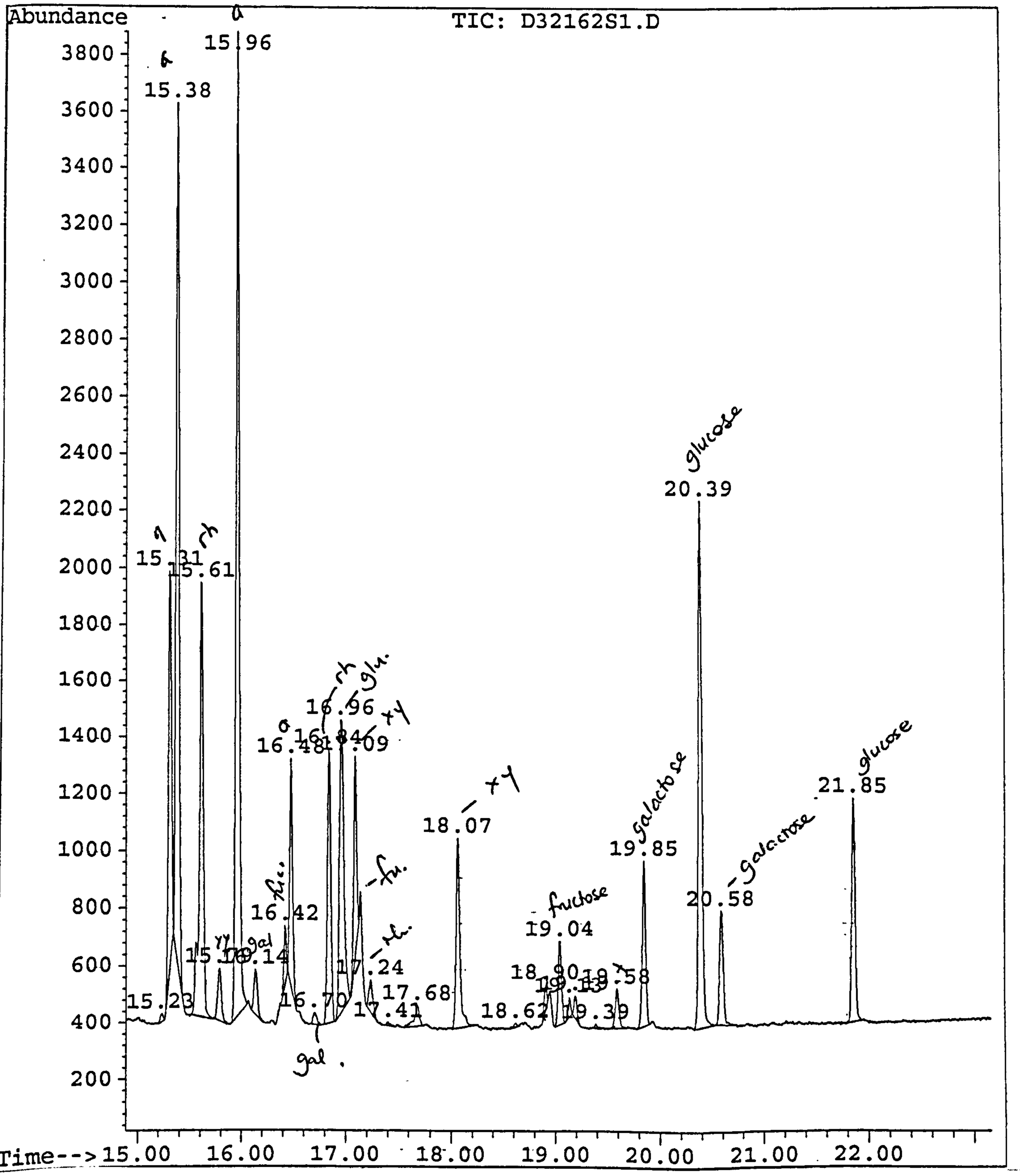


Fig. 107

File : C:\HPCHEM\1\DATA\SUGARS\D25467S1.D
Operator : Bronwyn
Acquired : 6 Jul 100 2:58 am using AcqMethod SUGAR5
Instrument : GCD Plus
Sample Name: Turner - D25467 sample 1
Misc Info : After HMDS run.
Vial Number: 1

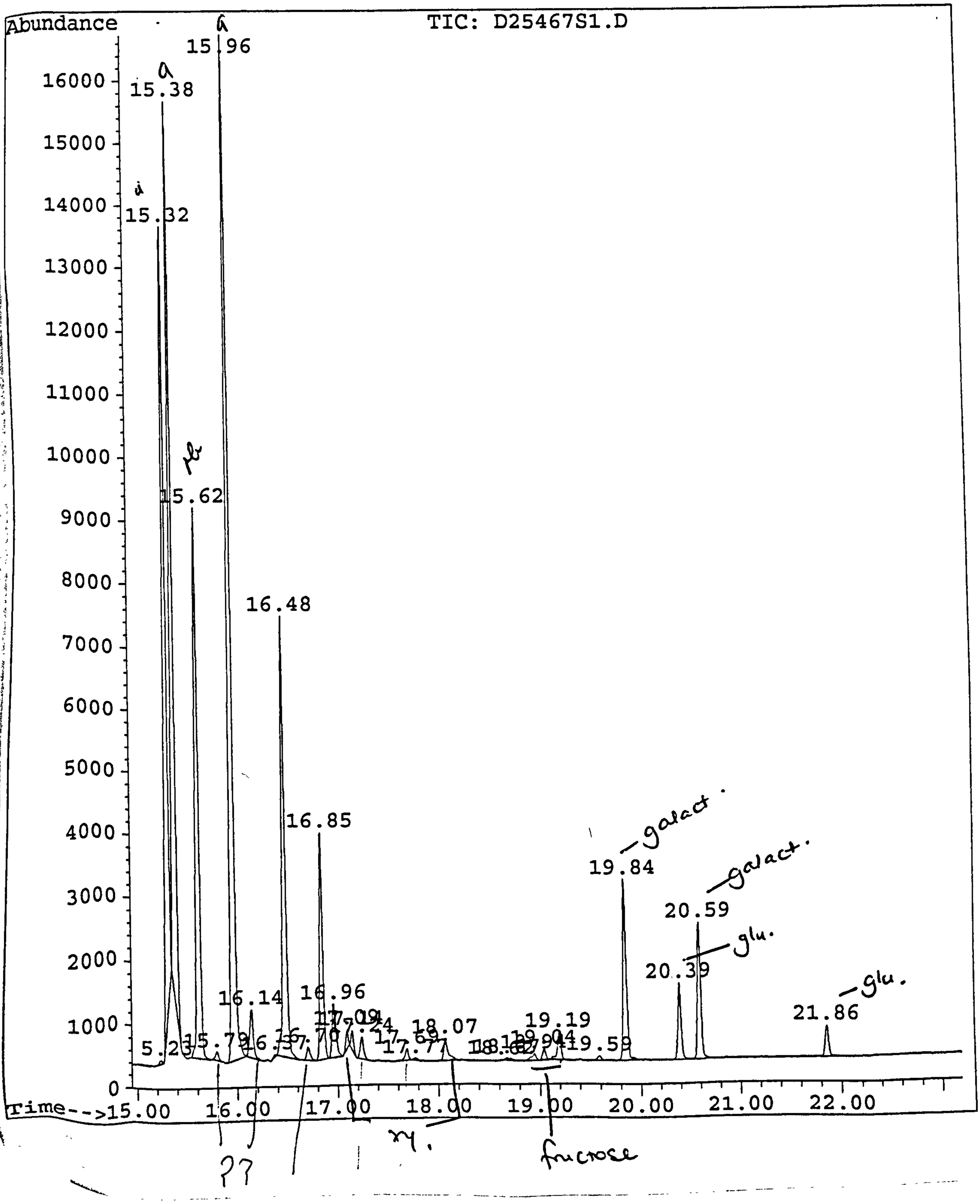


Fig. 108

... X_4 = Trag, Cherry Sarc, Tamarind.

1. Arabic
Tragacanth
+ Cherry ~~Z~~

2 Sugar/Honey (or Sarcocolla)

File : C:\HPCHEM\1\DATA\SUGARS\D25467S2.D
Operator : Bronwyn
Acquired : 5 Jul 100 10:51 pm using AcqMethod SUGAR5
Instrument : GCD Plus
Sample Name: Turner - D25467 sample 2.
Misc Info : After HMDS run.
Vial Number: 1

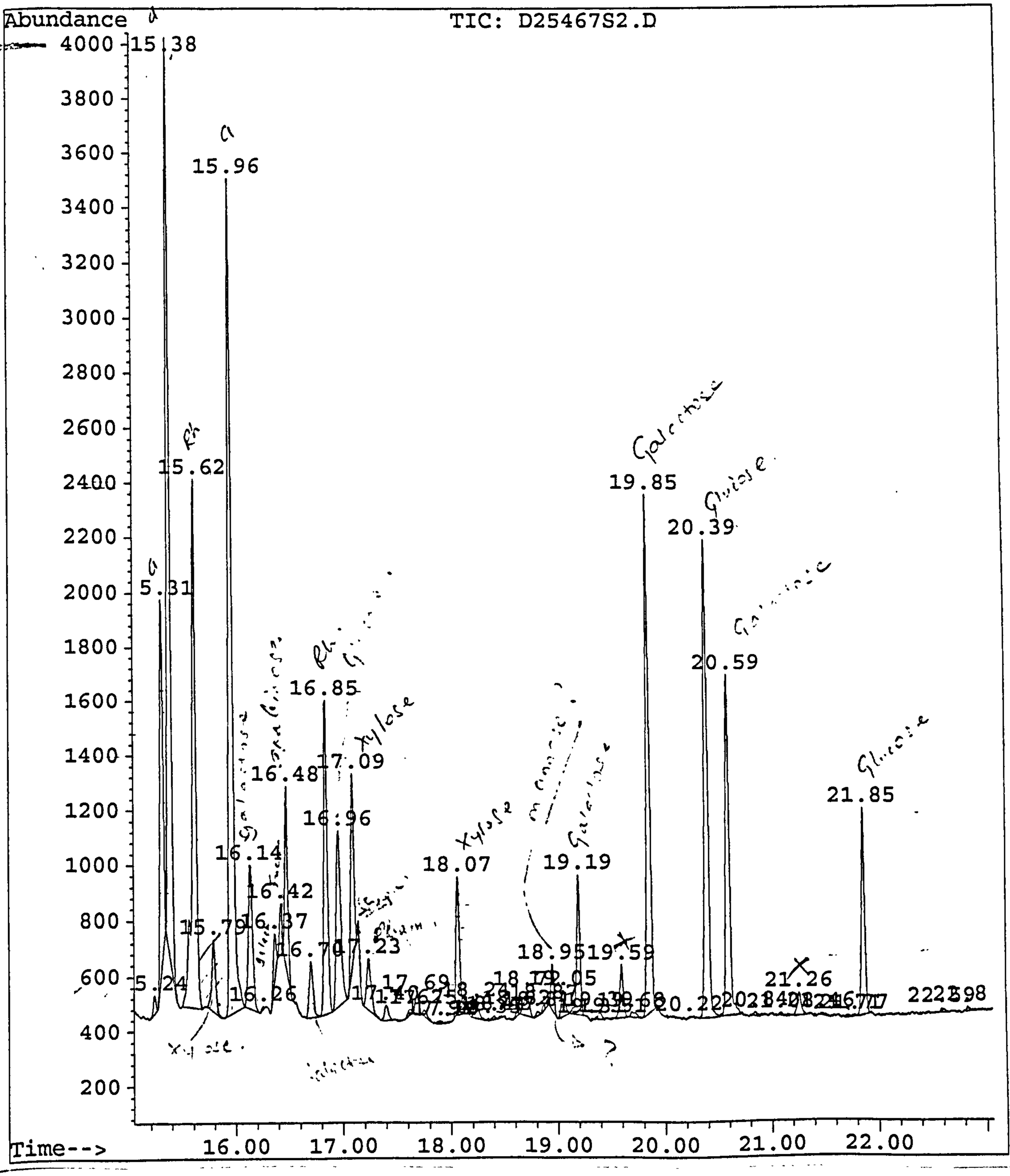


Fig. 109

Fig. 110) A sample of Prussian blue paint (possibly gouache/bodycolour) taken from the same work, containing arabic, tragacanth, cherry gums and trace sugar.

Fig. 111) A sample of black paint (possibly gouache/bodycolour) taken from the same work, containing arabic, tragacanth, cherry gums and trace sugar.

Samples of pure gum

Fig. 112) Gum arabic – note high arabinose and galactose peaks.

Fig. 113) Cherry almond gum – note high arabinose, xylose and galactose peaks.

Fig. 114) Gum tragacanth – note high xylose and arabinose peaks.

Fig. 115) Sarcocolla gum resin – note high glucose peaks.

Graphs of my own gum mixture experiments informed by the above

Fig. 116) No. 65 – containing arabic 35%, karaya 35%, cherry almond gum 10-15%, tragacanth 10% and sarcocolla 5-10%.

Fig. 117) No. 66 – containing arabic 35%, karaya 35%, cherry almond gum 10%, tragacanth 5% and sarcocolla 15% - close to Turner GCMS graphs.

Fig. 118) No. 67 – containing arabic 35%, karaya 35%, cherry almond gum 10%, tragacanth 10% and sarcocolla 10%.

Fig. 119) No. 77 – containing arabic 50% and cherry almond gum 50% - note high arabinose peaks in first third of the graph.

Fig. 120) No. 78 – containing tragacanth 30%, karaya 30%, arabic 20%, cherry almond gum 20% and trace sugar – graph suggests cut sugar and more galactose needed.

Fig. 121) No. 81 – containing tragacanth 70%, arabic 15%, cherry almond gum 15% - again high arabinose peaks, needs more glucose and galactose.

Arabic (Gross Extract) : Tragacanth, Arabic, Cherry

Tragacanth (+ Sarcolla) (? Cherry) + Cindy Sugar.

```
File        : C:\HPCHEM\1\DATA\SUGARS\D25467S3.D
Operator    : Bronwyn
Acquired    :  6 Jul 100  12:41 am using AcqMethod SUGAR5
Instrument  :   GCD Plus
Sample Name: Turner - D25467 sample 3.
Misc Info   : After HMDS run.
Vial Number: 1
```

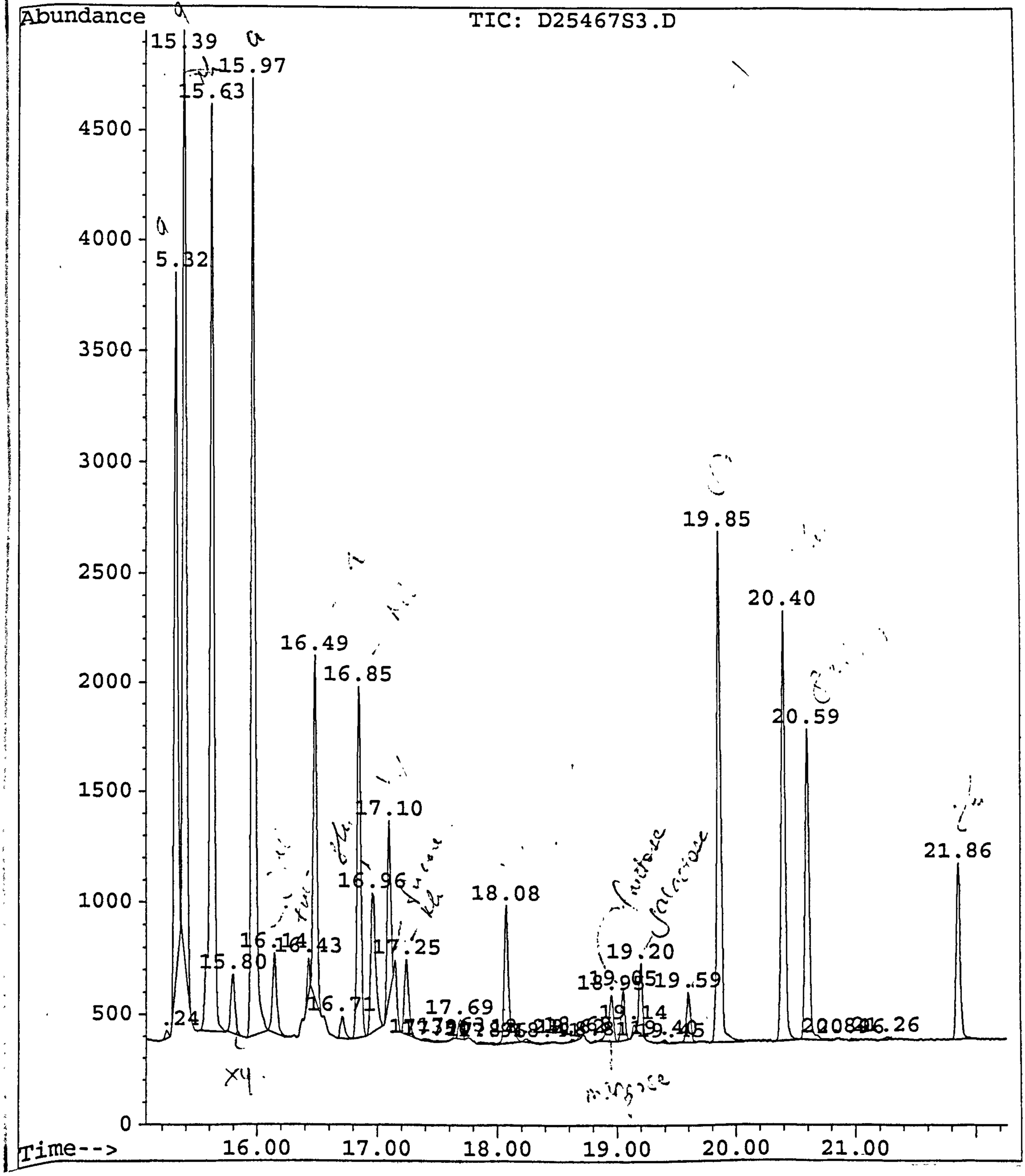


Fig. 110

= Tragacanth, Arabic; Cherry,

Arabic + Tragacanth
+ Cherry? + Sugar/honey.
+ Sarcocolla?

```
File         : C:\HPCHEM\1\DATA\SUGARS\D25467S4.D
Operator     : Bronwyn
Acquired     :  6 Jul 100    1:28 am using AcqMethod SUGAR5
Instrument   :   GCD Plus
Sample Name: Turner - D25467 sample 4.
Misc Info    : After HMDS run.
Vial Number: 1
```

Why Arabic? — Khamaka Karaya Cathartic

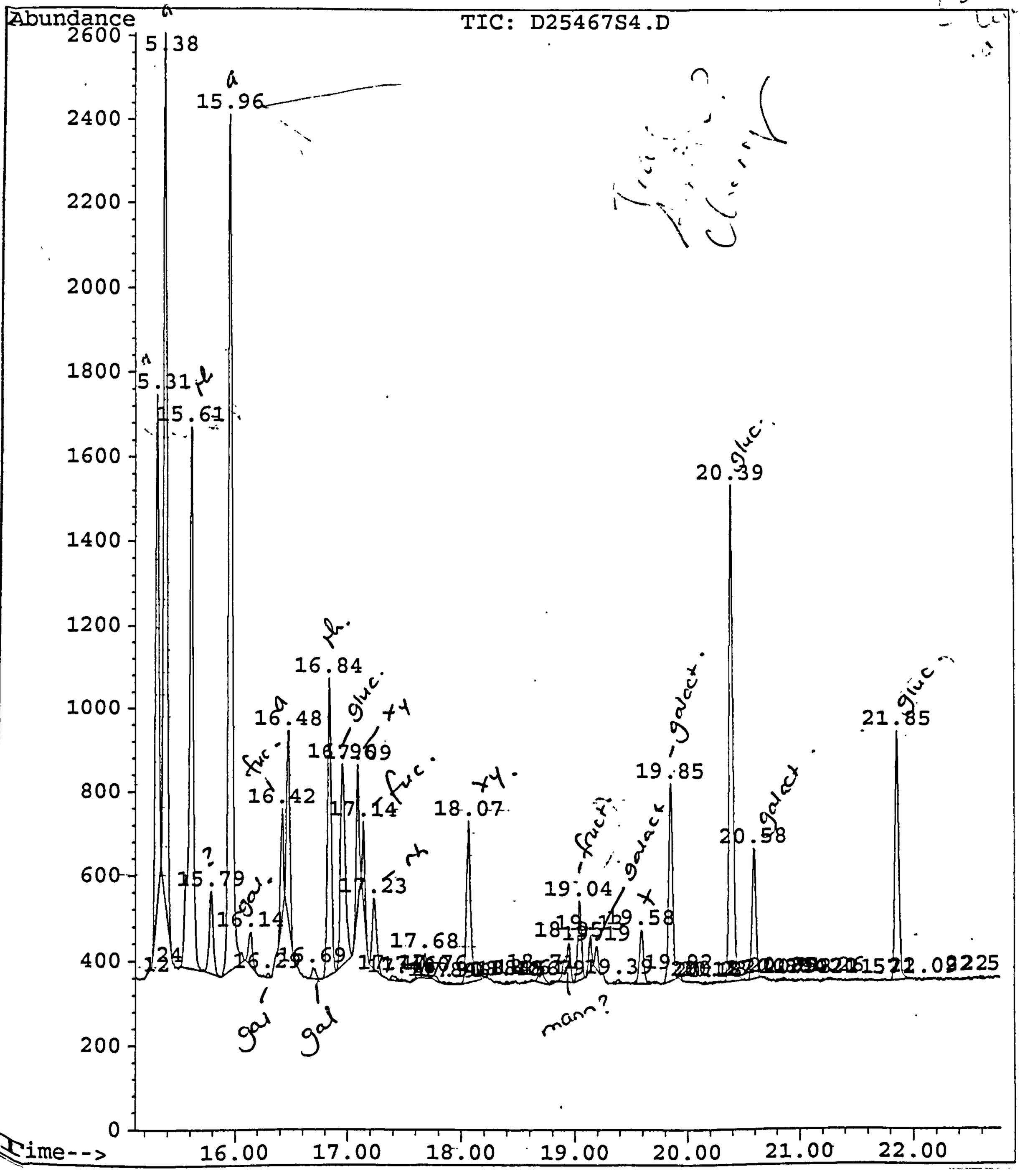
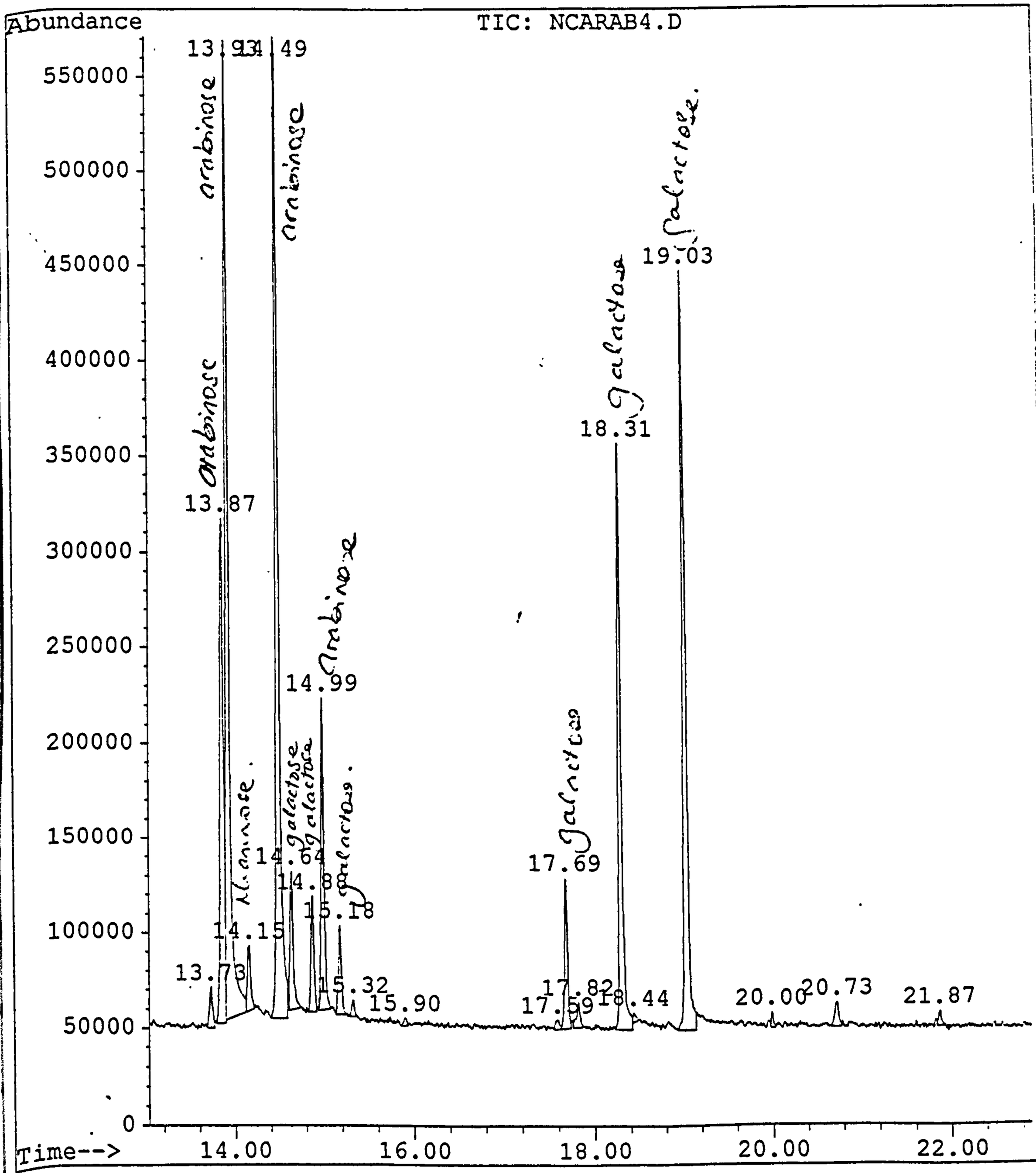


Fig. 111

File : C:\HPCHEM\1\DATA\SUGARS\NCARAB4.D
Operator : Bronwyn
Acquired : 23 Jun 99 12:10 am using AcqMethod SUGAR1
Instrument : GCD Plus
Sample Name: Nat Colloids gum arabic
Misc Info : Sample 4, run 23.6.99
Vial Number: 1

Gum Arabic - New



Try mixtures of 10% - 50%
arabic + trag + sugar / honey.
arabic + sugar / honey. (Turner pallets)

Fig. 112

File : C:\HPCHEM\1\DATA\SUGARS\CHERRY6.D
Operator : Bronwyn
Acquired : 19-Mar 100 4:17 am using AcqMethod SUGAR5
Instrument : GCD Plus
Sample-Name: Gum Cherry - time study
Misc Info : 14 days - run 6 of 7
Vial Number: 4

Fitzpatrick Chem 3

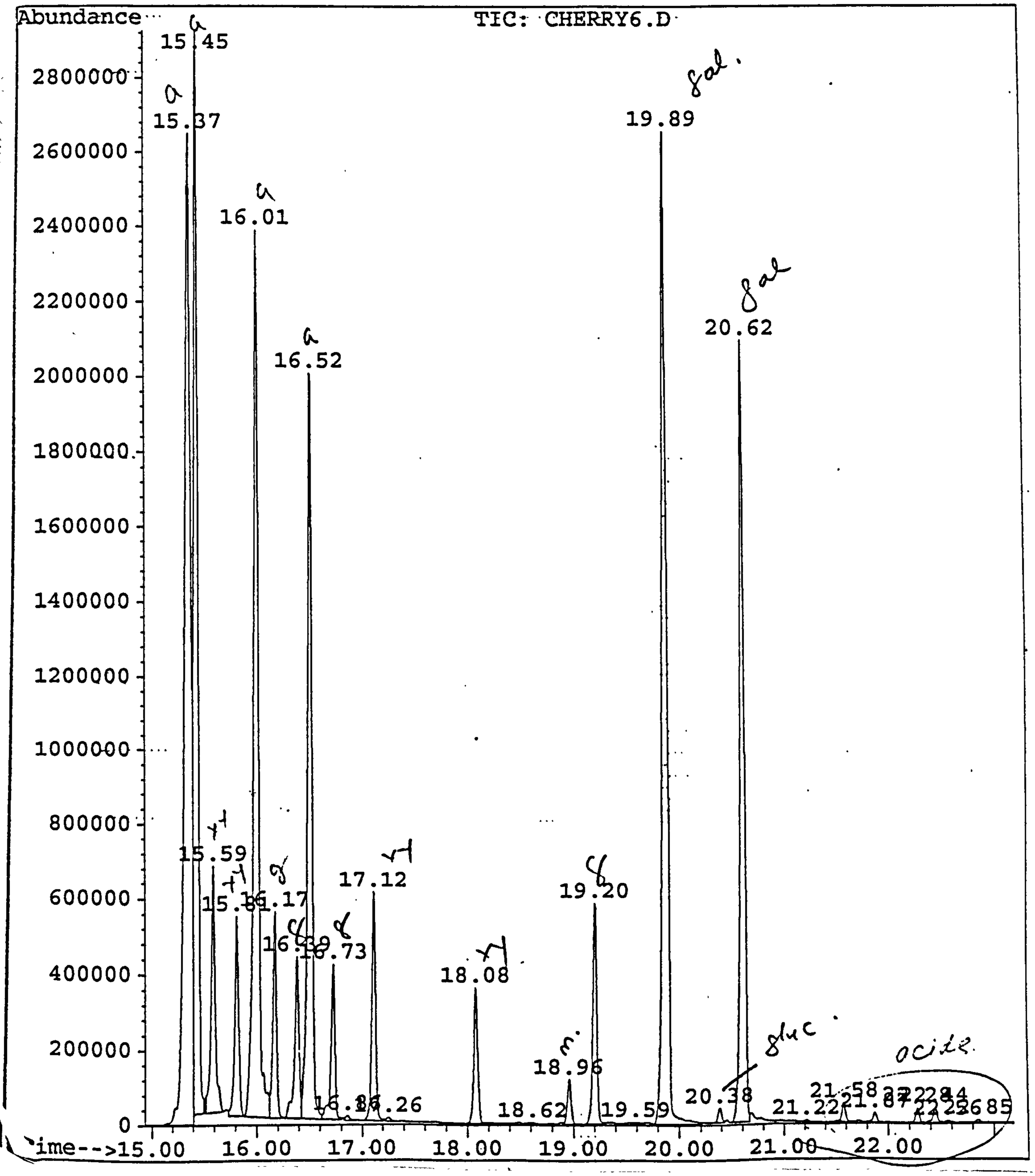


Fig. 113

12 New tragacanth.

File : C:\HPCHEM\1\DATA\SUGARS\TRAGKRE2.D
Operator : Bronwyn
Acquired : 10 Aug 99 2:17 am using AcqMethod SUGAR1
Instrument : GCD Plus
Sample Name: Kremer- Gum tragacanth - Run 2
Misc Info : Run 10.8.99
Vial Number: 2

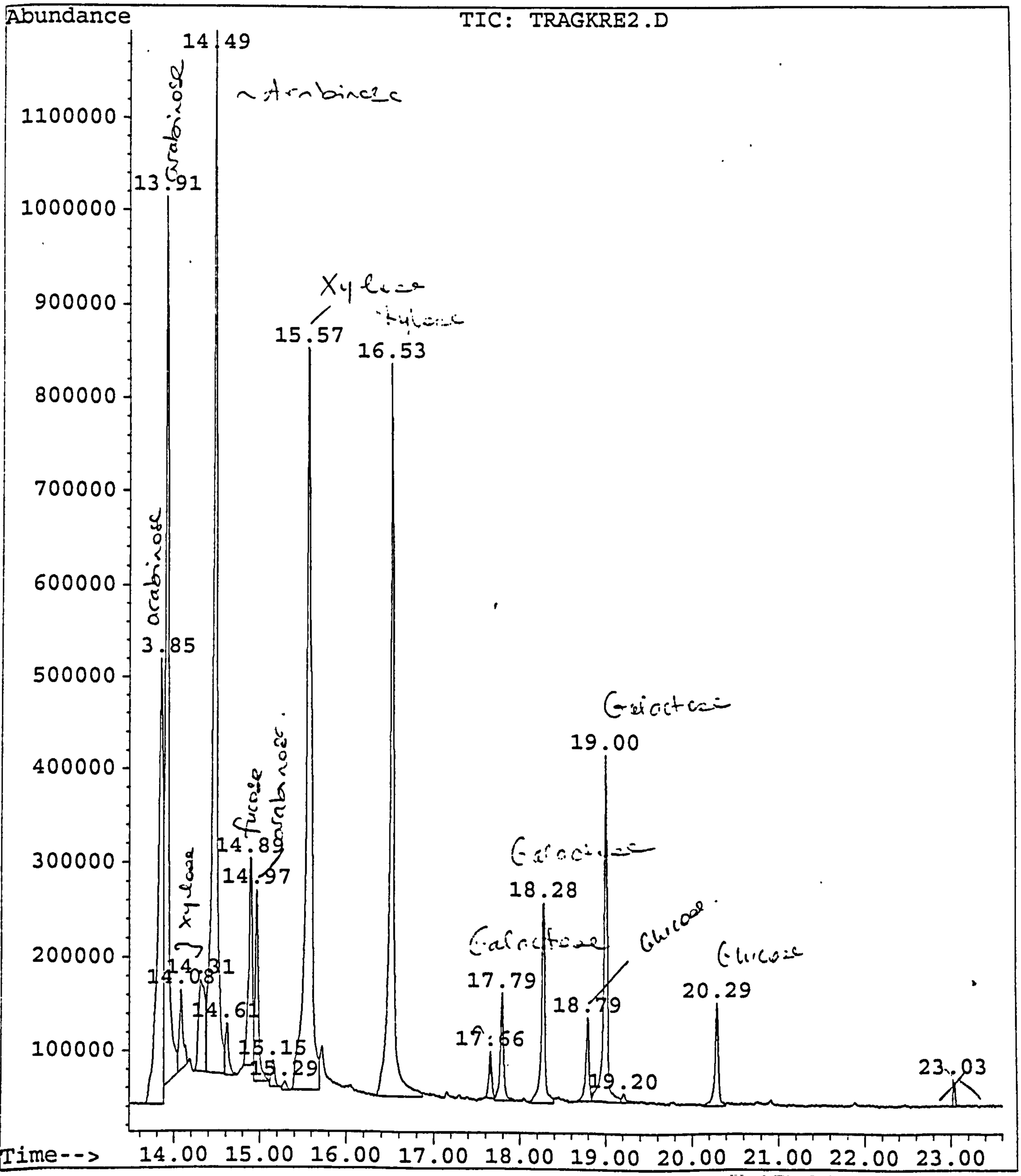


Fig. 114

Sarcocolla does not contain "fructose"
whereas sugar and honey ~~has~~ do have "fructose"

Efraims

```
File          : C:\HPCHEM\1\DATA\SUGARS\SARCOC4.D
Operator      : Bronwyn
Acquired      : 23 Feb 100  3:59 am using AcqMethod SUGAR5
Instrument    :   GCD Plus
Sample Name:  Sarcocolla sample---Paul Clarke run 2 of 2
Misc Info     : 24.2.2000
Vial Number:  1
```

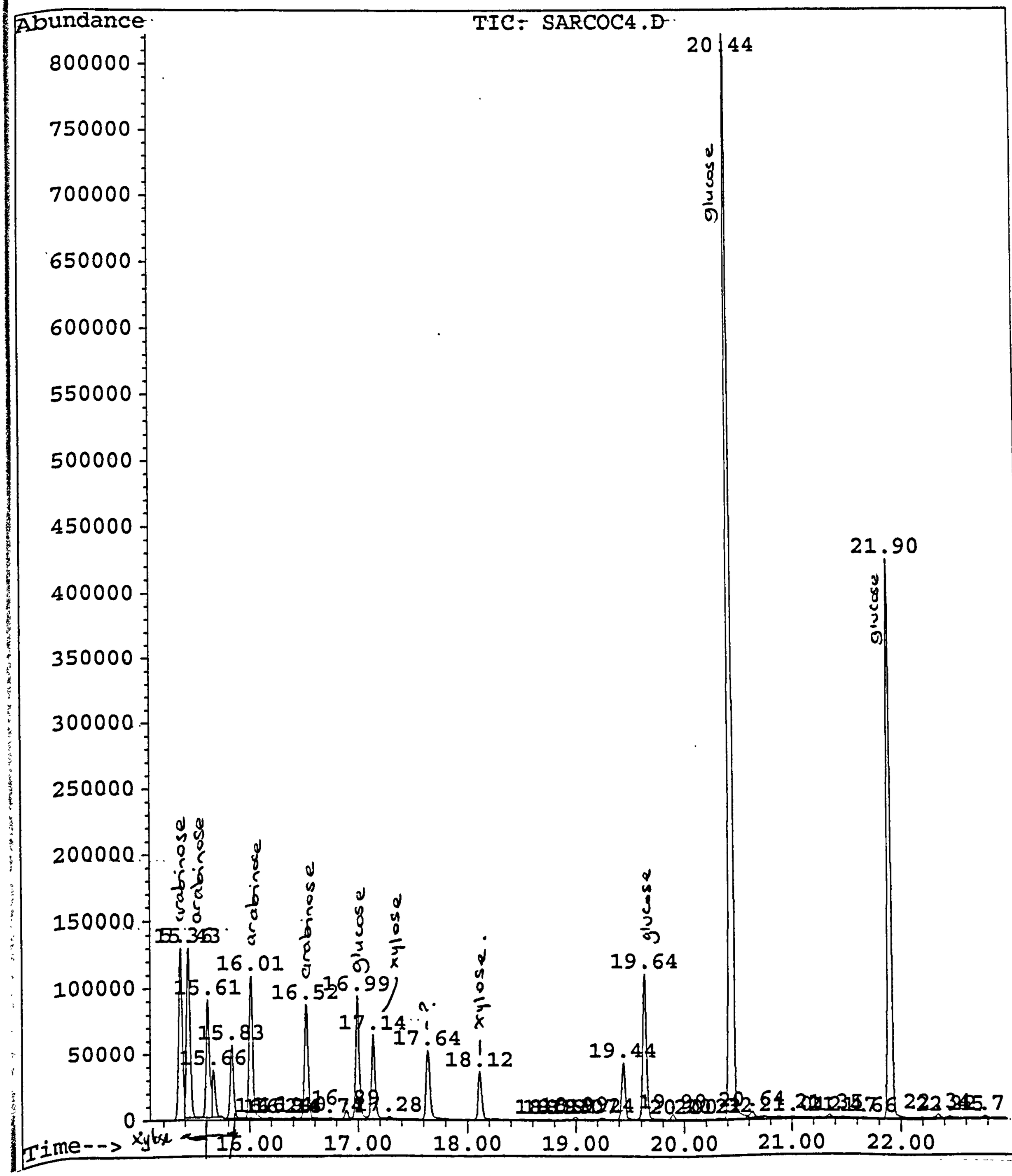


Fig. 115

File : C:\HPCHEM\1\DATA\SUGARS\PAUL40C.D
Operator : Bronwyn
Acquired : 5 Sep 100 4:51 am using AcqMethod SUGAR5
Instrument : GCD Plus
Sample Name: Paul's mixes - no. 40 run 3 of 3
Misc Info : Overnight
Vial Number: 3

Cut too much Sugar

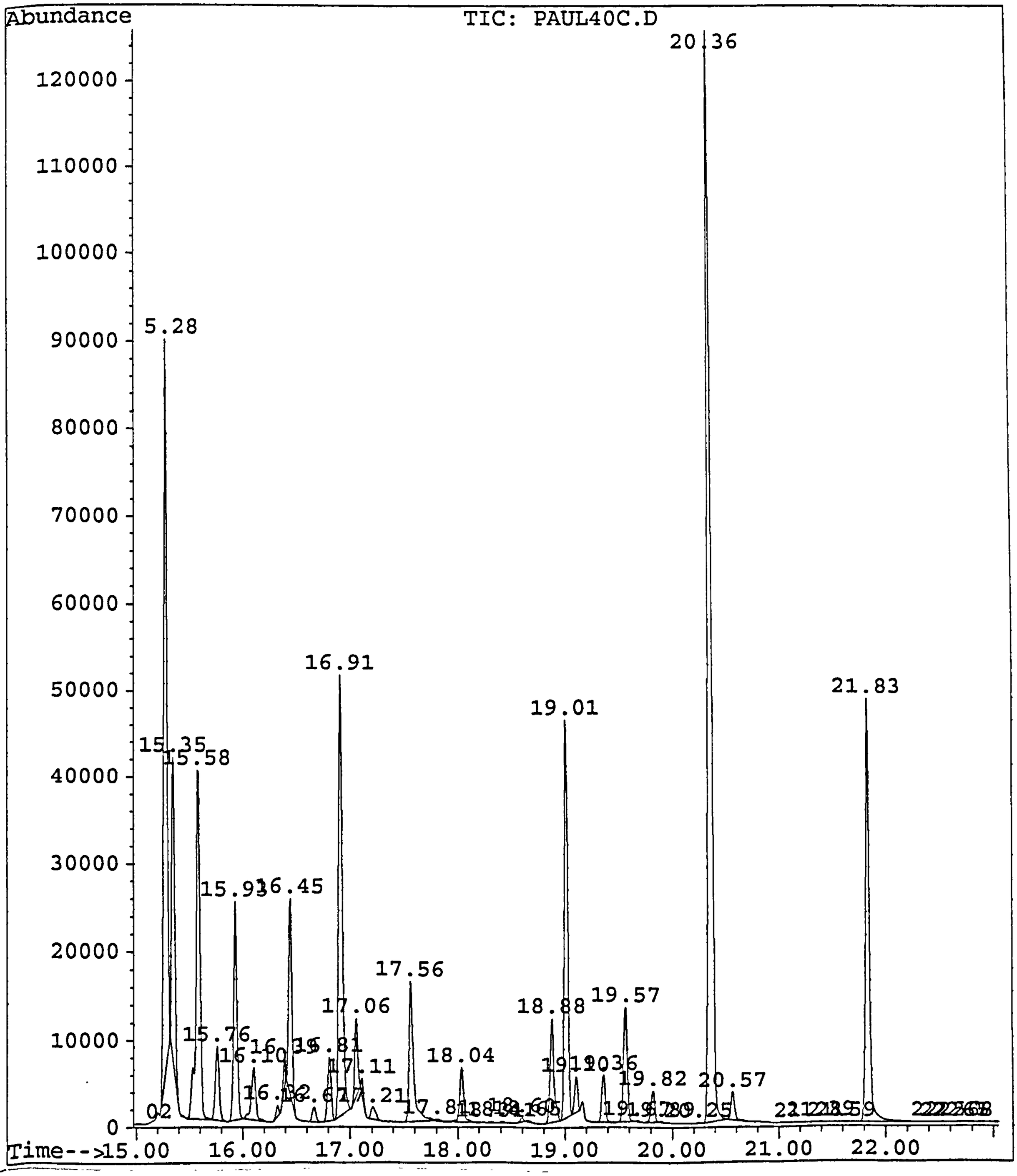


Fig. 116

35% 35% 10%-15% 5% 15%
Arabic Karaya Cherry Gum Tragacanth Sarcocolla

File : C:\HPCHEM\1\DATA\SUGARS\PAUL53B.D
Operator : Bronwyn
Acquired : 25 Jul 100 3:14 am using AcqMethod SUGAR5
Instrument : GCD Plus
Sample Name: Paul's mix - Number 53, run 2 of 2
Misc Info : SIM.
Vial Number: 1

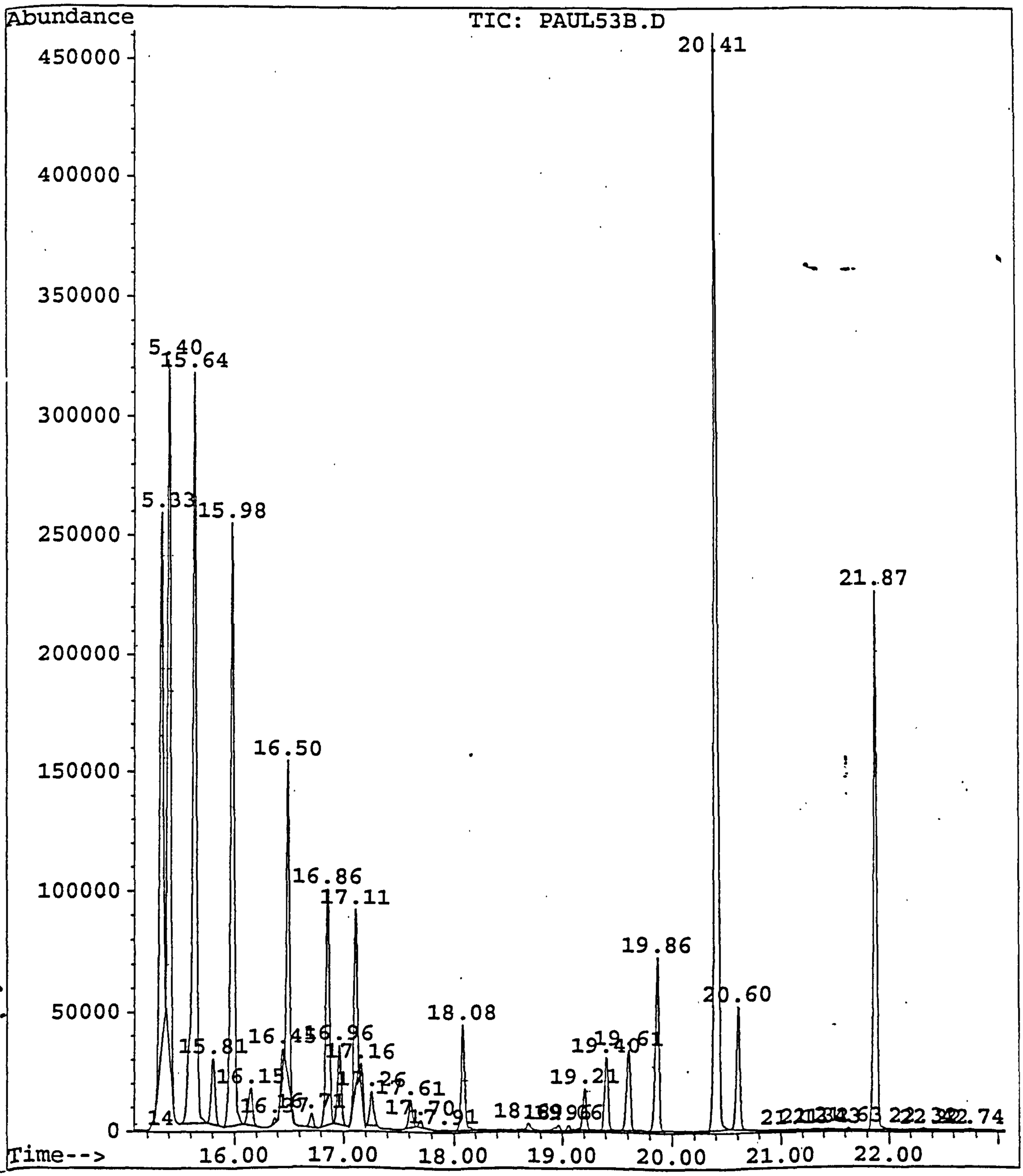


Fig. 117

35% 35% 10% ~15% 10% 10%
Arabic Karaya Cherry Gum Tragacanth Sarcocolla
No Sugar Candy = Better

```
File        : C:\HPCHEM\1\DATA\SUGARS\PAUL55BD.D
Operator    : Bronwyn
Acquired    : 26 Jul 100   1:14 am using AcqMethod SUGAR5
Instrument :   GCD Plus
Sample Name: Paul's mixes - No. 55 run 2 of 2
Misc Info   : SIM
Vial Number: 1
```

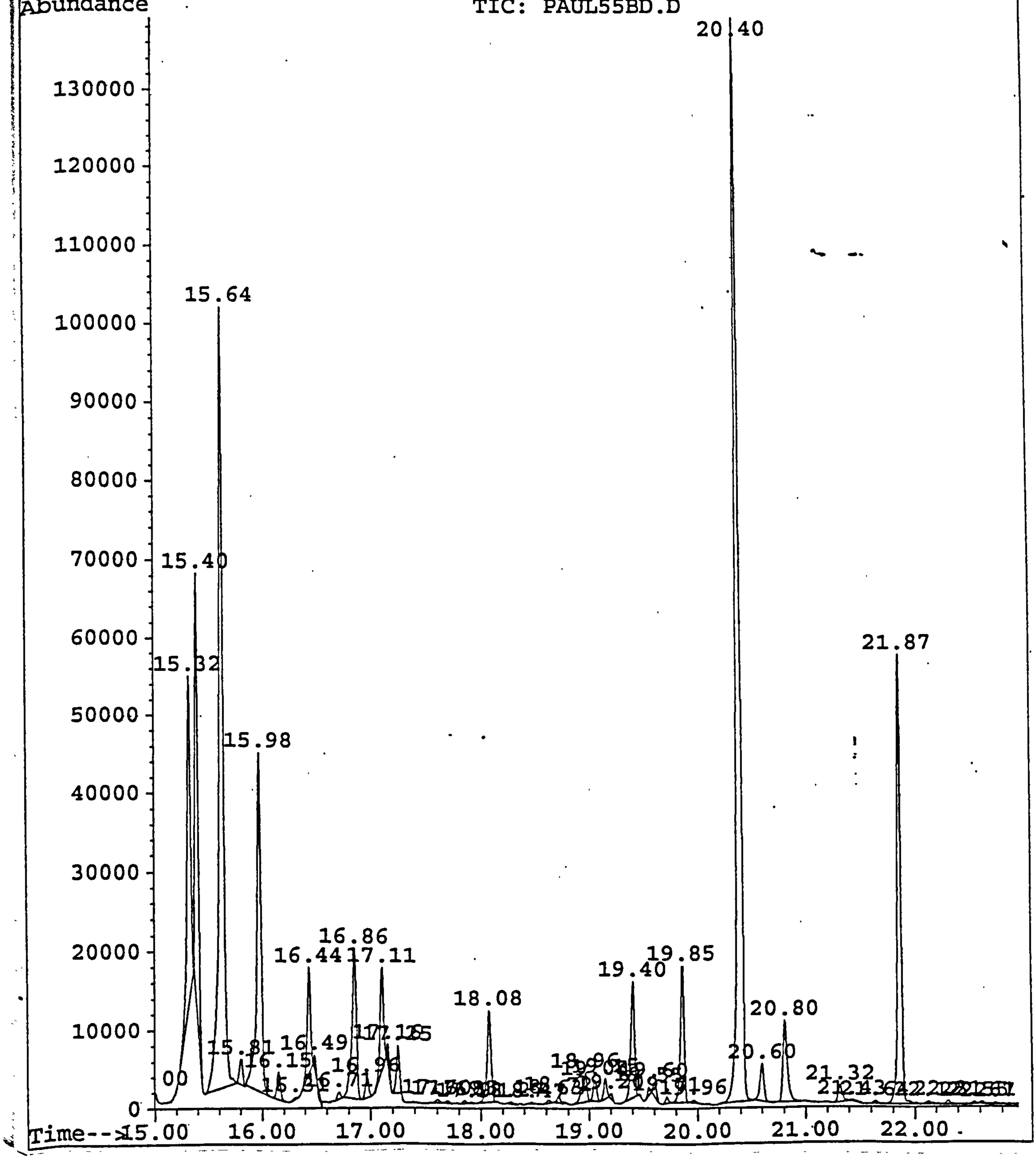


Fig. 118

50% Cherry 50% Arabic

```
File        : C:\HPCHEM\1\DATA\SUGARS\PAUL82B.D
Operator    : Bronwyn
Acquired    : 22 Aug 100    5:39 am using AcqMethod SUGAR5
Instrument :   GCD Plus
Sample Name: Paul's mixes - No. 82 run 2 of 2
Misc Info   : Run1
Vial Number: 1
```

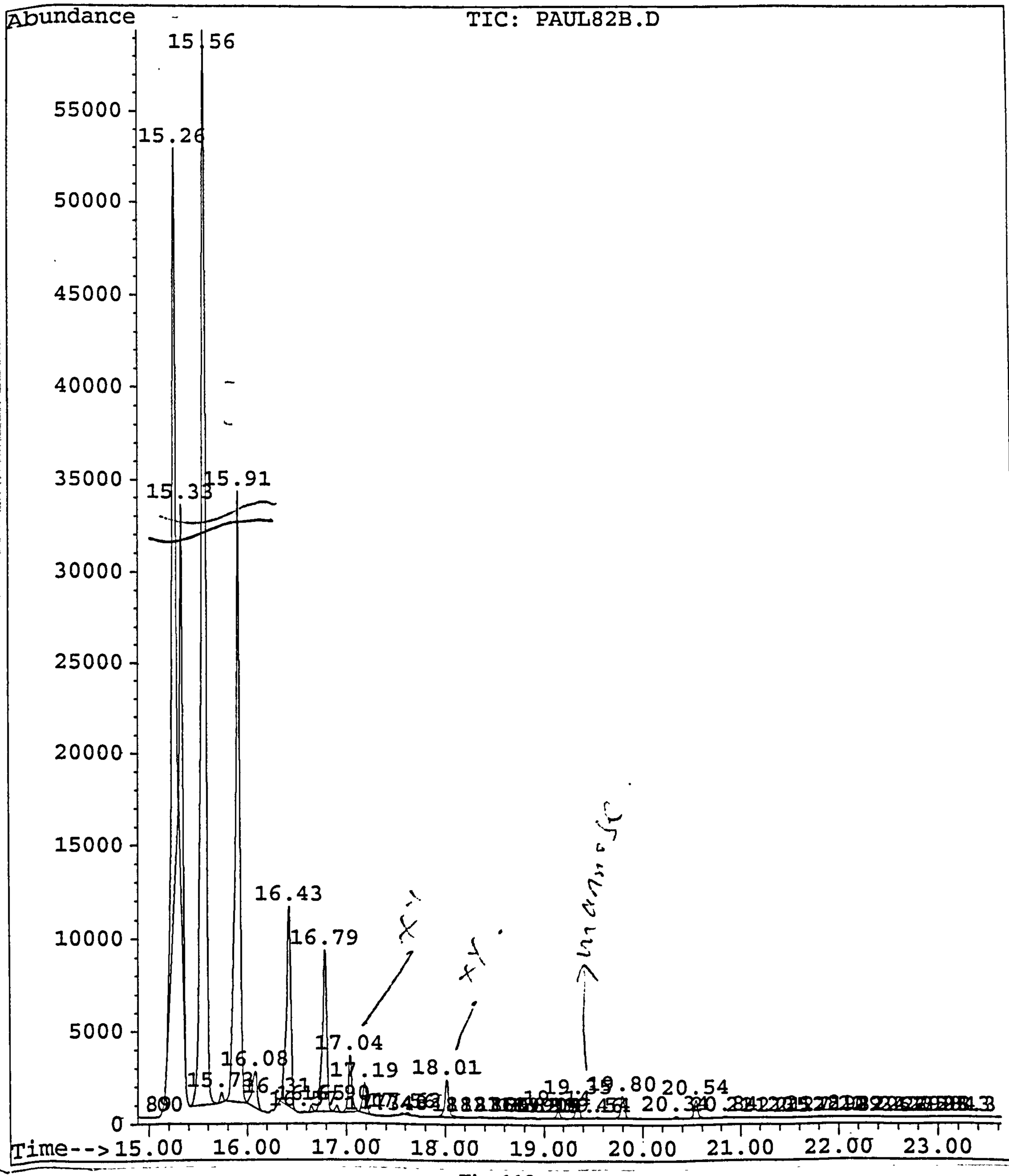


Fig. 119

E. Sept 7th 2000 Whack Tag BEST With No 40, 53, Cut Sugar Cut Arabic N640

Trag Karayn Cherry Arabic
30% 30% 20% 20%

More Galactose needed, = More Karayn 35-40% 35%
Trag 20% 10%
Cherry 20% 20%
Arabic 15% 35%
10% Santan

```
File         : C:\HPCHEM\1\DATA\SUGARS\PAUL71D.D
Operator     : Bronwyn
Acquired     :  5 Sep 100   4:09 am using AcqMethod SUGAR5
Instrument   :   GCD Plus
Sample Name: Paul's mixes - no. 71 run 4 of 4
Misc Info    : Overnight
Vial Number: 4
```

Cut ↓

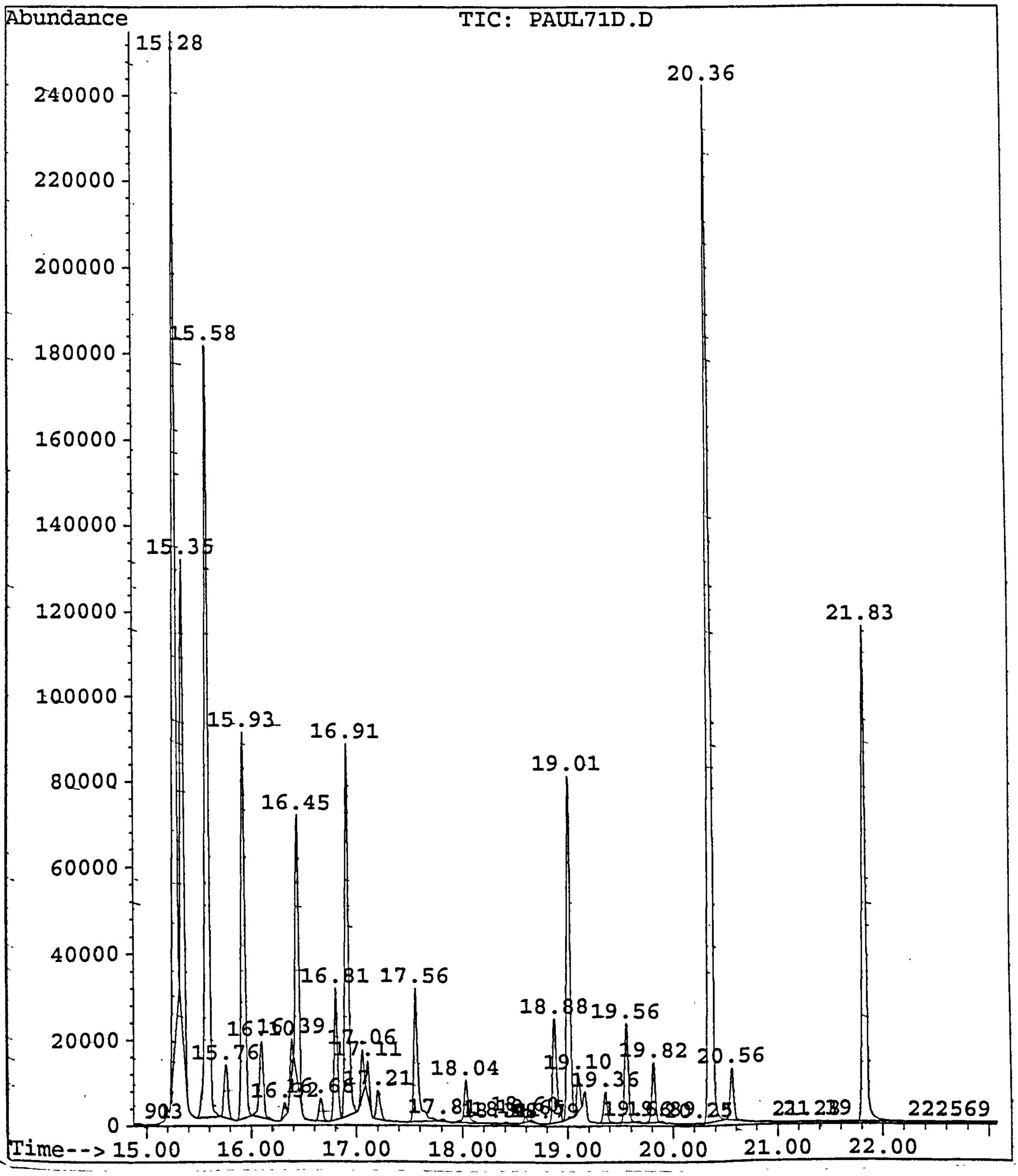


Fig. 120

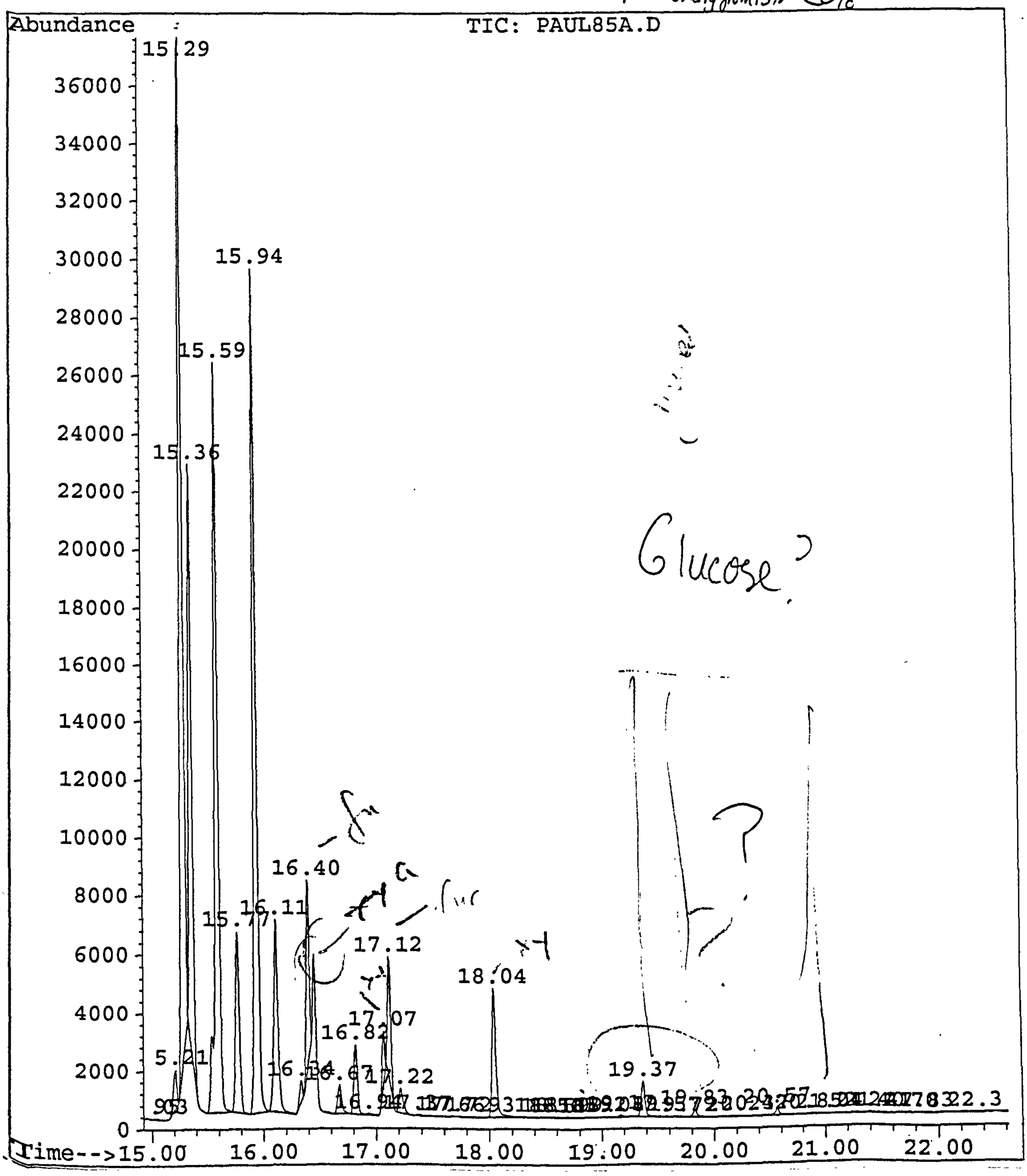
70% Tragacanth 15% Cherry Gum 15% Arabic
↓20%

Need more Glucose + Galactose

```
File         : C:\HPCHEM\1\DATA\SUGARS\PAUL85A.D
Operator     : Bronwyn
Acquired     : 21 Aug 100  12:03 am using AcqMethod SUGAR5
Instrument   :   GCD Plus
Sample Name: Paul's mix - no. 85 run 1 of 2
Misc Info    : After blank run
Vial Number: 1
```

Add a bit of Sugary binder 10% Karaya ?

70% Trag Tuhert to 50% 15% Arabic — 20% could leave Arabic 15% up the Cherry from 15% - 20%



Glucose?

Fig. 121

For the sake of brevity, I will illustrate only the most successful of a whole range of experiments which evolved from the above and preceding information; the rest are listed in Appendix A at the end of this chapter.

Note: Preparatory ratios for gums: arabic one level teaspoon to three and a half teaspoons water, one teaspoon of tragacanth or karaya to ten water, unless indicated otherwise; percentages of sugar, sarcocolla, powders or honey, measured by level teaspoon, eg. ten% of a teaspoon.

Nos.

52 Arabic 70%, karaya 20%, sugar candy 10%; appeared to be an improvement on other arabic samples, still washed up once dry and wet brush applied.

53 Arabic 60%, karaya 20%, sugar candy 10%, honey 10%; the inclusion of honey assists spreadability, - doesn't manipulate well as paint film.

54 Arabic 70%, cherry gum 10%, tragacanth 10%, sarcocolla 10% - slightly better on wash up test.

55 Arabic 70%, cherry gum 10%, tragacanth 10%, sarcocolla 10% with a pinch of sugar candy added which increased brittleness of paint film.

56 Arabic 70%, tragacanth 20%, sugar candy 10% - soft not hard paint films, washed up.

57 Arabic 70%, karaya 10%, sugar candy 10%, sarcocolla 10%; the inclusion of both sugar and sarcocolla at these amounts increased the propensity for wash up and brittleness of the paint film.

Previous experiments revealed that paint films containing tragacanth or karaya either mixed together or singularly with other gums/sugars seemingly matched some areas of *The Dark Rigi* (1842) (fig. 2) and an illustration of its companion the *The Blue Rigi* (figs. 5 and 6).

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Further experiments with these gums produced tough paint films that did not wash or wet up easily when a brush loaded with water was applied vigorously to the dry paint film.

58 Tragacanth 30%, karaya 30%, sarcocolla 20%, arabic 20% - produced very delicate tints, adhered well.

59 Karaya 70%, honey 15%, sarcocolla 15% - produced fair paint films, a little more brittle.

60 Tragacanth 30%, karaya 30%, sarcocolla 20%, sugar candy 20% - also produced very delicate tints, adhered well.

61 Tragacanth 70%, honey 15%, sarcocolla 15% - created delicate tough tints, the bottom of the sample especially appeared similar to areas of the lake in *The Dark Rigi* and *The Blue Rigi*.

62 Tragacanth 70%, honey 15%, sugar candy 15% - also behaved like number 61.

63 Karaya 70%, honey 15%, sugar candy 15% - also behaved like numbers 61 and 62.

64 A marginal experiment using mixtures numbers 58 and 59 suggested the subtle transparent tints found in the complex reflections in the lake above the jetty in *The Dark Rigi* (1842) and some of the vaporous effects on the sky. The slight drybrushed texture on top of these transparent tints matches especially many subtle marks in the Rigi's lake.

Numbers 58 to 63 could produce – though some better than others – ultra translucent yet tough paint films, similar to the "tinted steam" and vapour effects attributed to Turner. In addition they could also create buttery textured paint, or thixotropic megilps, which dissolve into transparent tints.

However, overall they were too matt and starch-like in appearance to match the majority of paint film textures in *The Dark Rigi*, especially in and around the mountain.

Evidently a high proportion of powdery paint textures can be found in works which contain much gouache/bodycolour such as *Lake Nemi* (1840) and *Florence* (1827) (figs. 11 and 7).

Further trials informed by the above and GCMS analysis of paint from Turner watercolours were necessary and produced the following.

65 Arabic 35%, karaya 35%, cherry gum 10-15%, tragacanth 10%, sarcocolla 5-10%, plus a pinch of sugar candy. Created tough paint films, spread well, successive tints layered well. The cobalt blue faded by applying a wet brush vigorously on the dry paint film (a test it passed well) matched very much areas in *The Dark Rigi*, particularly in the mountain. The vaporous tints and touches were also very convincing in this sample.

66 Arabic 35%, karaya 35%, cherry gum 10%, tragacanth 5%, sarcocolla 15%, similar to the above recipe – its GCMS analysis put it closest so far to the Turner gouache/bodycolour chromatographs (see figs. 106 to 111); see comments below.

67 Arabic 35%, karaya 35%, cherry gum 10%, tragacanth 10%, sarcocolla 10%, no sugar candy added. Similar to numbers 65 and 66 but the chromatograph of this sample did not read as close to the Turner samples as number 66.

68 Arabic 15-20%, karaya 35-40%, cherry gum 5%, tragacanth 5%, sarcocolla 30% - proved too powdery and inert as a spreadable paint film and GCMS analysis placed it further away from the Turner samples.

69 Arabic 35%, karaya 35%, cherry gum 5%, tragacanth trace to 5%, sarcocolla 20% - similar to some of the above recipes, again GCMS placed it further from the

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Turner samples than number 66 – note how easily the cobalt has washed out in wet brush test.

Using recipe number 66 to paint the Rigi's peak, it proved similar to the original in areas where the colour had washed and faded out; overall it was too matt and starch-like.

GCMS chromatographs show that the inclusion of sarcocolla in my gum mixtures produced higher glucose peaks than those present in the Turner samples (figs.106 to 111). In addition the arabinose peaks in my samples (number 66 was closest so far in GCMS terms to the Turner samples) were still about a third too low in comparison, though many of the other peaks closely correlated.

The rhamnose component (a sugar found in high proportion in karaya) could also be lowered or cut out altogether as it is present in arabic too. With the removal of sarcocolla and lowering of sugar candy, there was further room for experiment and the fine tuning of gum ratios and combinations.

Ormsby's establishing the relative abundance of fucose in tragacanth, mannose in cherry gum and xylose in tragacanth and cherry proved invaluable when experimenting with their quantitative levels. Cherry gum could be increased (for example 50-60% or more) at the expense of arabic and tragacanth or the ratios staggered in combination. This would help close the gap on the arabinose levels since all three gums contain it in abundance.

One crucial discovery was that the inclusion of more than approximately 35% arabic/acacias to 65% tragacanth or tragacanth/karaya combinations increases the likelihood of the paint films becoming brittle or washing up, especially if too much sugar candy is added to the equation. On the other hand, if too little arabic/acacias are present

the paint becomes inert. It remained a question of balance between adhesion, solubility tempered with paintability.

71 Tragacanth 40%, karaya 20%, cherry gum 20%, arabic 20% - this mix produced fluid paint films that remained quite stable when subjected to the wash up test.

72 Tragacanth 50%, karaya 10%, cherry gum 25%, arabic 15% - similar to above but more starch-like.

73 Cherry gum 50%, arabic 20%, tragacanth 15%, karaya 15% - effective paint films, performed well on wash up test.

74 Tragacanth/karaya 33%, arabic 33%, cherry gum 33% - similar to above, performed fairly well on wash up test.

75 Tragacanth 25%, karaya 25%, arabic 25%, cherry gum 25% - not too bad on wash up test, the faded area of cobalt blue similar to areas in *The Dark Rigi*'s mountain, but better examples to come.

76 Arabic 30%, cherry gum 30%, tragacanth 20%, karaya 20% - produced a more brittle paint film in the cobalt blue area. As a by-product, the ultra translucent stains that spill over the chrome lemon tint are similar to stains in many areas of *The Dark Rigi*, particularly in the sky and lake.

The following proved closest to the paint film textures in *The Dark Rigi* (1842) (fig. 2) when compared during repeated visits to the Laing Gallery, Newcastle in August and September 2000

77 Arabic 50%, cherry gum 50% (note arabic ratio was 1 part to 3½ water, cherry almond gum 1 part to 10 water). Its faded grainy texture created by the wash up test on the cobalt blue matched extremely closely, if not precisely, the mountain's texture and many other areas of *The Dark Rigi*, although the original was of a

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slightly darker tint of blue (attainable by adding Prussian to cobalt blue). There still appeared room for improvement in the Prussian green films of paint in the bottom third of this sample.

This experiment also produced arabinose peaks in the GCMS chromatograph of the sample (see fig. 119).

78 Tragacanth 30%, karaya 30%, arabic 20%, cherry gum 20% and a pinch of sugar candy – again the faded grainy texture of cobalt blue matched many areas of *The Dark Rigi*'s mountain, whilst the feathered touches and sharp lines of paint were comparable to the vaporous marks in the sky and elsewhere in the picture.

79 Arabic 50%, cherry gum 40%, tragacanth 10% - based on a GCMS analysis of Reeves watercolour medium (circa 1800) sampled by Ormsby (see fig. 93). Again proved fairly effective, though washed up more than the above two.

80 Tragacanth 35%, karaya 35%, arabic 15%, cherry gum 15% - though the cobalt films are starchy, the Prussian green painted well and matched many areas in the lake of *The Dark Rigi*. Once this sample was dry, like the next one, it was extremely difficult to wash out or fade with water.

81 Tragacanth 70%, arabic 15%, cherry gum 15% - also produced tough paint films that hardly washed up, the Prussian blue green also matched areas in the lake of *The Dark Rigi*.

It is worth noting that the strength of the paint films of numbers 80 and 81 were remarkable when subjected to the wash up test and, like number 78, suggested their suitability as a gouache/bodycolour binder.

Since many of the above mixtures, including cherry almond gum, proved very successful, further trials with this species were attempted. Commercially cherry gum is extremely difficult if not near impossible to obtain. AP Fitzpatrick, Fine Art Materials,

London, supplied the above almond variety, harvested in Greece but, due to erratic supplies, deleted it from their range.

In response I gathered samples exuded from cherry trees at the Botanic Gardens, Durham University. The gum did produce a paint binder when dissolved in water. Unfortunately, in our damp climate, the gum had absorbed much moisture as well as dirt and air pollution (some specimens gathered near a busy road). Even after attempts at purification and decanting, the binder still contaminated the paint films with a dull, dirty cast.

Far more effective were paint films using cherry gum from Aubenas, near the Ardèche region, south of France which I managed to obtain. I was assured by the gatherer, M Didier Morisot (Botanic Garden, Montpellier University) that the orchard had no chemical intervention at all and grew in sunny south west – a warmer and purer Mediterranean climate.

The results can be seen in numbers 82, 83 and 84 and rank among the closest to Turner's paint films and textures (see also experimental composition fig. 122).

Preparation

The Aubenas cherry gum was broken into pieces, pounded and ground in a pestle and mortar to a granular powder. This was measured 1 teaspoon to 6 teaspoons of water initially and kept in a screw top glass jar; the sediments and foreign bodies were allowed to settle to the bottom over several days, like wine in a decanter. The resulting liquor mixed with pigment.

82 Aubenas cherry gum 50% (1 part to 6 parts water) and arabic 50% (1 part to 3.5 water). Produced fine transparent light, mid and opaque tones, adhered well in

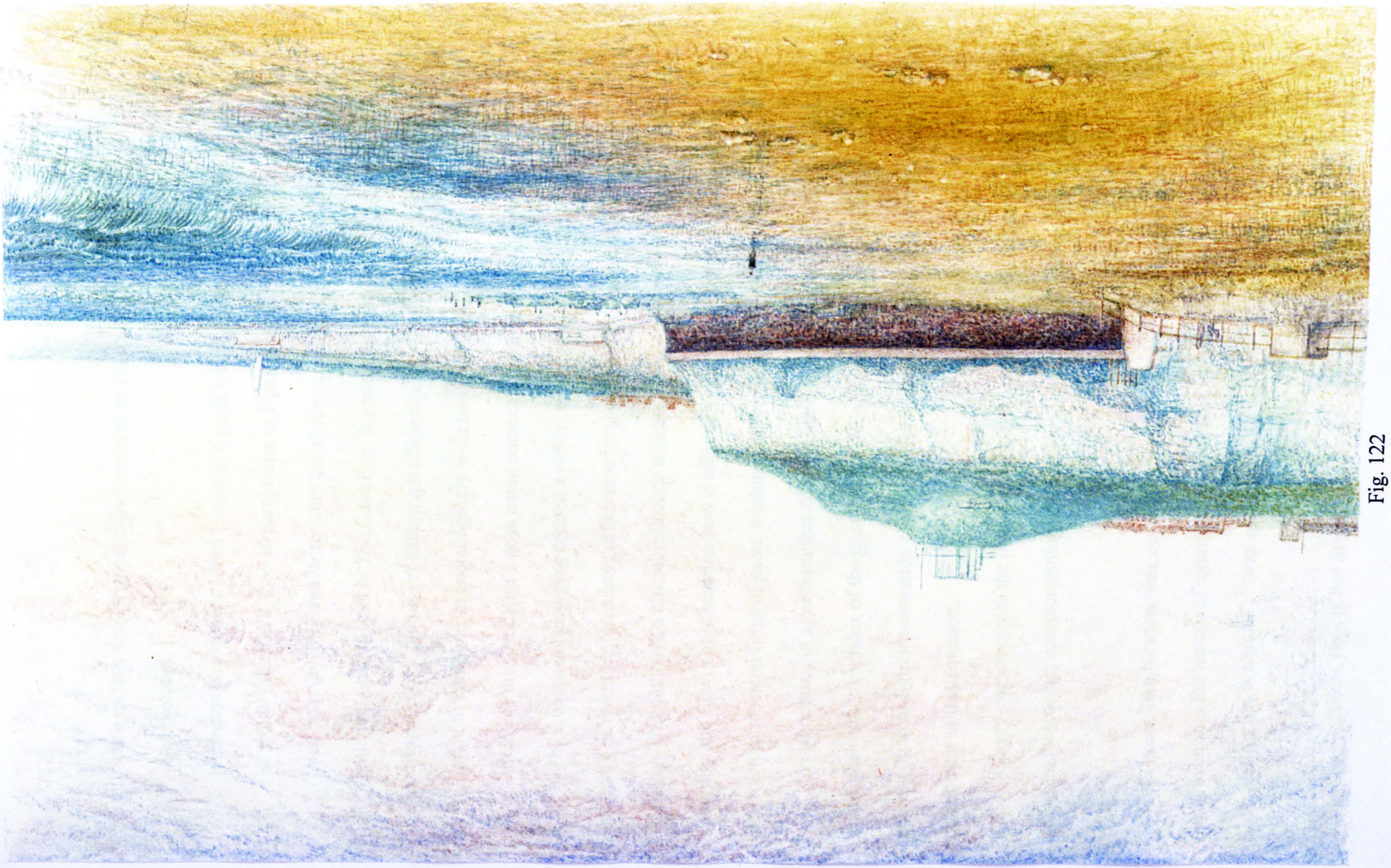

Fig. 122

wash up test, similar to paint film textures in *The Dark Rigi* and other Turner watercolours.

83 Aubenas cherry gum 100% (1 part to 6 parts water) – perhaps a little too gummy, it would dilute to 8, 9 or 10 parts water to 1 part gum and still be effective, but this was no problem. Even better than the above experiment, matching the very light, mid and opaque tints in *The Dark Rigi*. It performed very well in the wash up test, the paint film fading yet adhering sufficiently and facilitated crisp, sharp marks of paint to complete an encouragingly wide range of tones.

84 Study of the Dark Rigi's peak using number 83 mix proved quite promising.

The Aubenas cherry gum created a richer, more brilliant tone to the paint films. Evidently different climates have different effects on the gum, its nature, purity and viscosity. This can have a crucial influence on how the paint deposits on the paper, its solubility and flow, not to mention how it adheres to its surface and performance when subjected to repeated films of paint, washings of water and other vigorous techniques.

Furthermore, in a medium that depends upon light as much for its structure as effect, the refractive index of the gum coating the pigment particles can have a crucial bearing on their light transmission characteristics – any dirt or pollutants are obviously detrimental to this equation.

Cherry gum occupies the pale yellow, amber, orange to ruby red part of the spectrum, balancing, complementing and absorbing the remaining green, blue to violet range.

Turner, like Newton, was certainly interested in how light and colour were closely interwoven into the texture of natural forms and time. Indeed "that the action between Light and Bodies is mutual",[72] was as central to Turner's art as Newton's natural

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[72] Isaac Newton, *Opticks*, Book II, Part III p276; see also table on p272 (1979, Dover pub., reprint).

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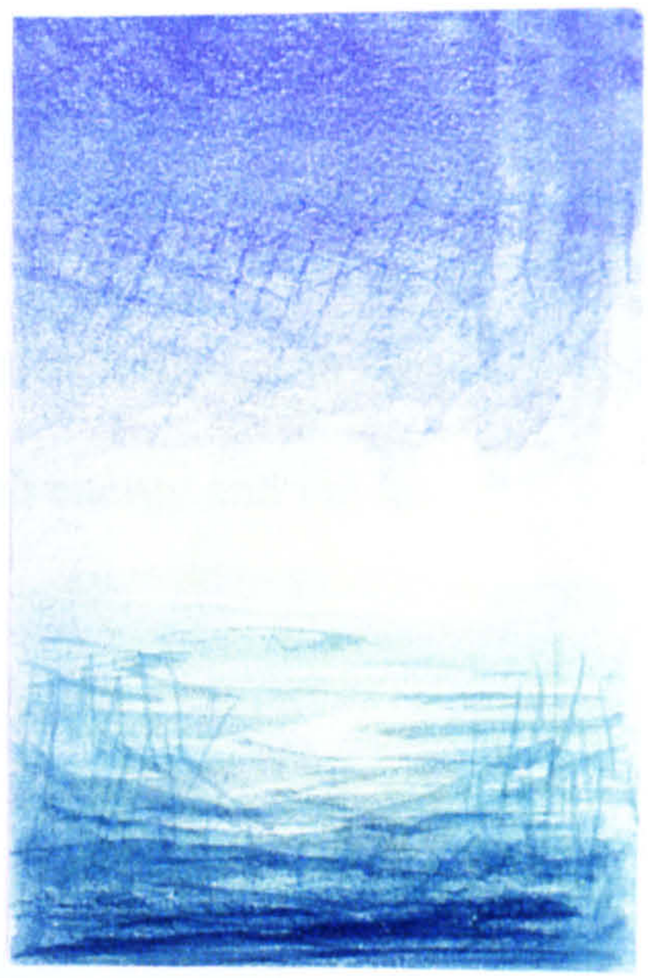

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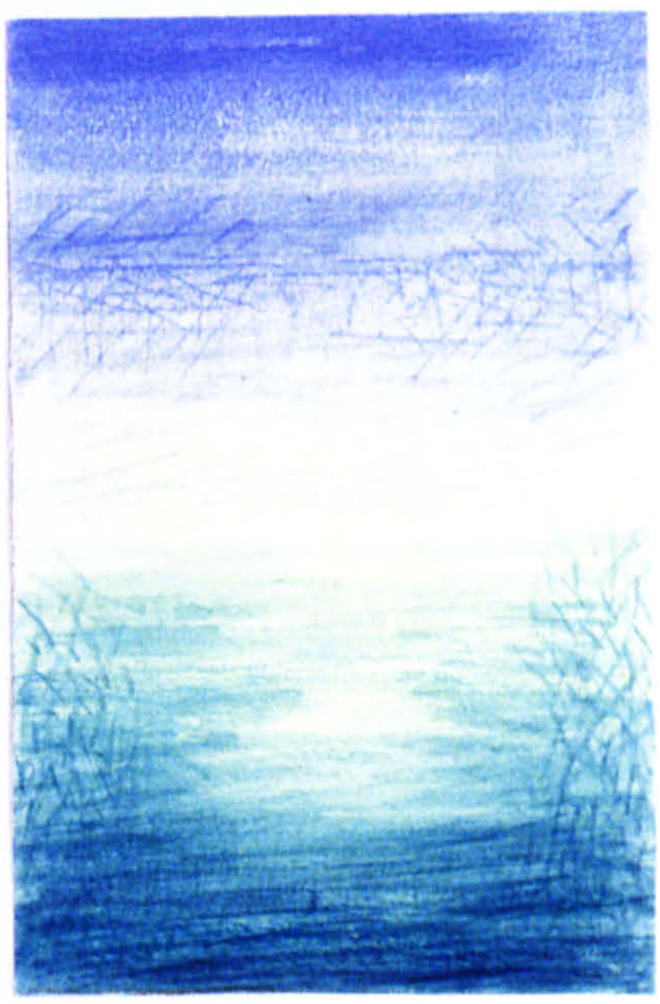

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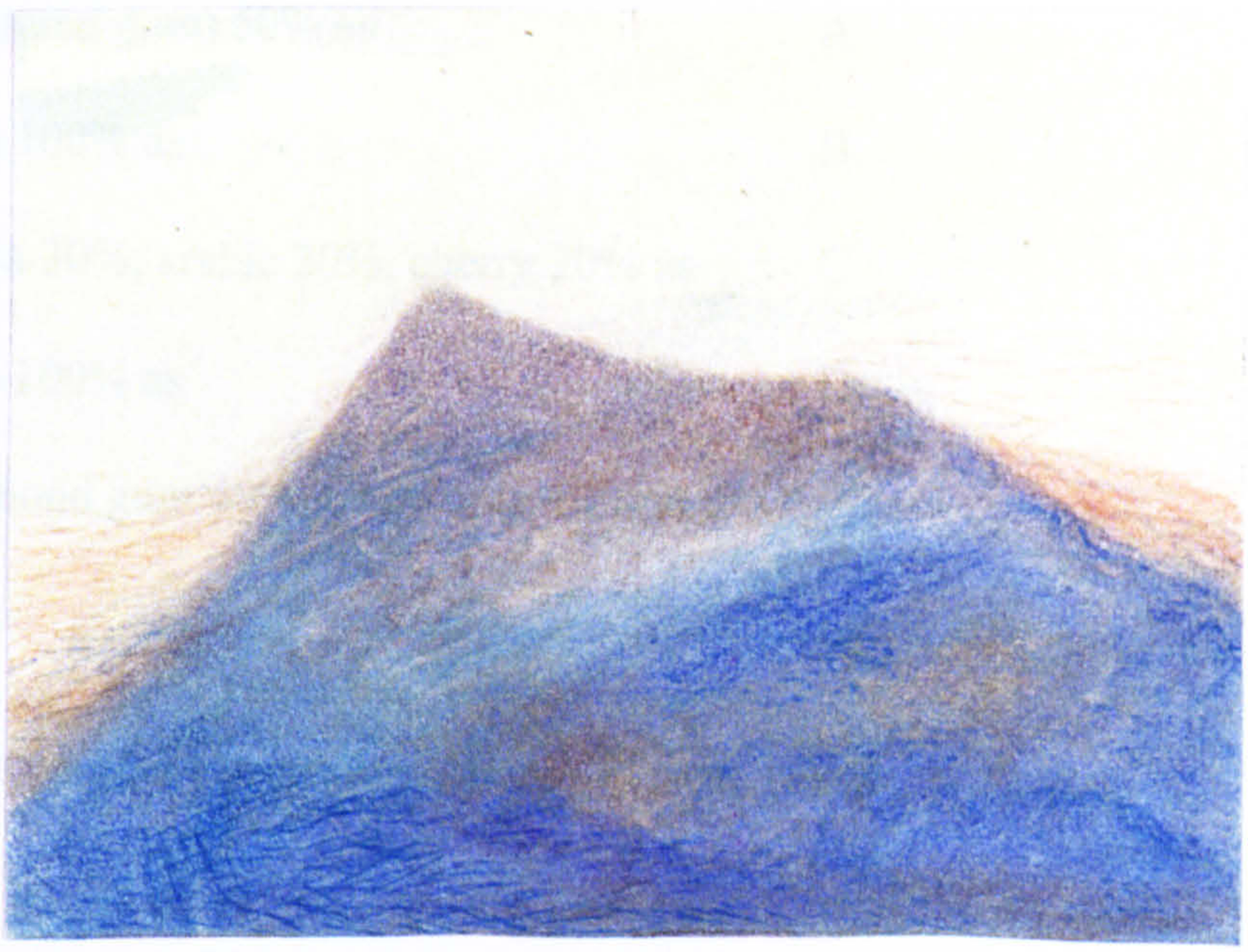

philosophy. Here we have a tangible example of a substance in the middle degree between those of earthy substance and water at work.

Such gums enabled Turner to bind imaginative ideas as particles of paint in fiery, airy, watery and earthy elements. All were fixed onto the paper with energy and vigour or, in calm pools of contemplation.

Making watercolour paints like Turner's

On 30 January 2001, it was possible to compare my gum binder/pigment experiments with 110 of Turner's watercolour at *Turner, The Great Watercolours* exhibition held at the Royal Academy, London, 2 December 2000 to 18 February 2001.[73]

The exhibition title was no exaggeration and represented a whole range of work from a lifetime's achievement in the medium. Though the *Dark Rigi* (1842) (fig. 2) was absent, its companions the *Blue Rigi* (1842) (figs. 5 and 6) and the *Red Rigi* (1842) (fig. 137) were on display; however this absentee would, without a doubt, have been among the star performers.

I compared by eye the textures of my samples with each of the 110 watercolours on display.

Here I refer to the following experiments.

No. 77	Arabic 50% cherry (almond gum) 50% as	A
No. 83	Cherry gum (Aubenas) 100% as	B
No. 78	Tragacanth 30%, karaya 30%, arabic 20%, cherry 20% as	C
No. 84	Cherry gum (Aubenas) 100% as	D
No. 79	Arabic 50%, cherry almond gum 40%, tragacanth 10% as	E

[73] See Eric Shanes, *Turner, The Great Watercolours* (2000), Royal Academy of Arts, London, for complete illustrated catalogue of this exhibition.

No. 81 Tragacanth 70%, arabic 15%, cherry 15% as F

No. 80 Tragacanth 35%, karaya 35%, arabic 15%, cherry 15% as G

Among the watercolours:

2 appeared to contain A singularly.

14 appeared to contain B singularly.

27 appeared to contain a combination of A and B.

25 appeared to contain a combination of A, B and C, and possibly 15 more.

7 appeared to contain a combination of A, B and D.

8 appeared to contain a combination of A, B, C and D.

6 appeared to contain a combination of A, B C and F.

2 appeared to contain a combination of A, B, C, D and E.

5 appeared to contain a combination of C and F.

2 appeared to contain a combination of A,C, F and G.

1 appeared to contain a combination of B and F.

1 appeared to contain a combination of C, F and G.

1 appeared to contain a combination of C, F, A, B and D.

1 appeared to contain a combination of A, E and B.

1 appeared to contain a combination of B, C, F and E.

1 appeared to contain a combination of B, E and F.

1 appeared to contain a combination of C, F, E, A and G.

From the above I concluded that:

Gum arabic on its own will not provide the subtleties of tone evident in Turner's paint films. A range of gums, including cherry, tragacanth (and possibly karaya) sometimes singularly and in combination with each other and additives, were present,

matching in many parts my experiments nos. 78 and 81, as well as nos. 77 and 84. It is worthwhile to remember the latter two gums (tragacanth and karaya) need to be mixed with either arabic/cherry or honey/sugar in order to produce fluid tough paint as my experimental compositions figs. 102 and 103 confirm.

The larger watercolours, especially those which mimic oil painting techniques such as *Mont Blanc from Fort Roch, Val d'Aosta* (c1814) (fig. 32) 69 x 104cm (exh. cat. no. 21) and *Landscape: Composition of Tivoli* (1817) 67.6 x 102cm (exh. cat. no. 68), appear to contain a higher proportion of tragacanth in combination with other gums/sugars in bodycolour/gouache preparations.

Medium sized works such as those found in the *England and Wales s*eries, *Swiss* and *Italian s*eries, *Lake Albano* (c1828) (figs. 9 and 10) 28.6 x 41.2cm (exh. cat. no. 63), the *Blue Rigi* (1842) (figs. 5 and 6) 29.7 x 45cm (exh. cat. no. 104) and *Dock Yard, Devonport, Ships being paid off* (c1827) 28.7 x 43.9 cm (exh. cat. no. 89), all appear to contain gums arabic, cherry, tragacanth and bodycolour/gouache.

The smaller works, such as the *Rivers, Harbours, Ports of England* series and miniatures – *Norham Castle* (1823) (figs. 3 and 4) 15.6 x 21.6cm (exh. cat. no. 55) and *Totnes, on the River Dart* (c1824) 16.2 x 23cm (exh. cat. no. 59) matched principally the arabic/cherry samples nos. 77, 83 and 84.

On the whole, Turner's paint films and washes dilute, disperse and gradate finely. The paint does not remain colloidally inert but displays the best of both spreadability and adhesion.

This suggests that honey / sugar candy and ox gall were operative. These additives help the pain to brush out, disperse and flow more easily. Ox gall especially reputed to break the surface tension of the water and its inclusion, whether in the paint or the water vessel, is usually measured for example 2 to 6 drops per fluid ounce.

The next step was to improve the dilution, dispersal and gradation of my own gum binder formulations.

Since no. 77 (Arabic 50%, cherry almond gum 50%) and no. 83 (cherry gum 100%) had not only featured strongly in the comparative studies at the above exhibition and with the *Dark Rigi* (1842) (fig. 2), I chose these recipes as a core for further experiments.

Firstly I reassessed the information available on gum to honey/sugar ratios and other additives in the late eighteenth and early nineteenth century colourmen recipes, together with a range of recipes post-1850 to the present day. Combined with my own experiments and Ormsby/Vallance's GCMS analysis of Turner watercolour paint samples, palettes and watercolour blocks, a whole range of practical possibilities exist to fine-tune and match Turner's paint films and effects.

We know that Reeves c1766 used honey in their watercolour cakes[74] and a box of Reeves watercolour cakes c1791-1800, GCMS analysed by Ormsby (see fig. 93), revealed sugars in trace to moderate amounts but, as with many colourmen, no precise recipes of their formulae exist.

The Rudolph Ackermann recipe c1801 (see fig. 94) contained the following ratios (the amount of pigment is not specified, and ox gall is absent). The first preparation is to be used for the majority of pigments listed in fig. 94, predominantly earth colours.

1. 2 quarts of water, 12oz gum senegal, to 5oz sugar candy. This approximates a 2-to-1 sugar ratio.

2. Specifically for Prussian blue, bistre and burnt carmine: 2 quarts of water, 14oz gum senegal, plus 1 pound distilled vinegar, to 6oz sugar candy and 2oz honey; again approximates a 2-to-1 gum-to-sugar/honey ratio.

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[74] M Goodwin (1966:17).

3. Chiefly for white pigments: 2 quarts of water, 5oz gum arabic, 2 oz sugar candy; approximates a 2½-to-1 gum-to-sugar ratio.

4. For ultramarine, carmine, smalt and precipitate of gold: 2 quarts of water, 3oz gum senegal, to 1oz sugar candy; approximates a 3-to-1 gum-to-sugar ratio.

A box bearing the original label *R Ackermann, Manufacturer of superfine watercolours to His Majesty*, dated pre-1837 (private collection) containing 22 watercolour blocks, full and fragmented, including earth pigments, chrome yellow, Prussian blue, zinc white, themselves labelled *Honey Colours / Couleur Sans Danger*; all have Ackermann labels but some have Newman labels and not all the Ackermann's had the 'honey' label.

Ormsby's GCMS analysis revealed glucose as the main component, sometimes the only one. Other blocks, like the samples taken from Turner's paint boxes/palettes, included arabic with honey/sugar in trace-to-moderate amounts[75] but again not quantified.

14 watercolour cakes belonging to the colourman Roberson's firm (est. 1810)[76] dated between 1854-1890 were sampled and GCMS analysed by Ormsby June 1999 – 2000. They were found to contain arabic with trace-to-moderate amounts of honey/sugar predominantly, though identifying other gums with high arabinose and other shared components with arabic could be imprecise. However 18 recipes for Roberson watercolour paints from the same archive, some dated 1840, 1839, 1833, proved very interesting – in addition a further 16 recipes were referred to, though in less detail as some of the equations were in code. From the list of 18 recipes, 5 included the naturally gummy gamboge yellow, and different quantities of gum-to-honey; one included dragon's blood, gum and honey; four more were in code and obtuse, whilst five contained

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[75] Personal communication 21 September 1999 Ormsby / J Towsend.
[76] Personal communication, Ormsby July 1999 – 2000. The Roberson Archive ref. 778/1993 Fitzwilliam Museum, University of Cambridge.

similar pigment, gum-to-honey and ox gall ratios as the three following examples:

Crimson lake c1840
1lb pigment
1lb gum arabic or senegal
½oz honey
½oz gall
1oz carmine

Burnt umber c1840
1lb colour pigment
¾lb gum
1oz honey
½oz gall

Cobalt blue c1833
1lb pigment
12oz gum
½oz honey
¼oz gall

In sum, 8 of the 18 Roberson recipes approximate a 16 part gum to 1 part honey ratio.

In addition, from the same archive, a recipe for Newman's lamp black c1840 – a colourman whose paints Turner used – suggests:

1lb Newman's lamp black
24oz gum
8oz sugar candy
2oz honey
1oz gall

Approximating a 3-to-1 gum-to-sugar/honey ratio, quite a difference from the majority of Roberson recipes.

So far we have seen a range of recipes from the late eighteenth to early and mid nineteenth centuries which include honey/sugar candy in varying amounts, from Ackermann's and Newman's use of a 2-2½-3 part gum to 1 sugar/honey ratio to Roberson's tendency of a 16 part gum to 1 honey.

Honey as a substance is quite complex. As a food, it contains 38% fructose, 31% glucose, 2% sucrose, 17% water.[77] As DV Thompson reminds us, honey was added in gum preparations to help prevent the paint film from becoming brittle.[78] The glucose and fructose found in honey/sugar candy and in high quantities of sarcocolla gum resin (see nos. 40-48) no only imparts fluidity but a lustre and luminosity to paint films, though they must be used in controlled amounts, lest the paint films wash up in successive layers.

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[77] J Charlton, J Newdick, *A Taste of Honey* (1995:26), Quarto Books.
[78] DV Thompson, *The Materials and Techniques of Medieval Painting* (1956:57), Dover.

In addition, a watercolour medium called *laevulose* can be extracted from pure pale honey by exposing it to the air until it has crystallised and become semi solid. It is then mixed with four times its own bulk of pure grain alcohol, put into a jar and thoroughly shaken from time to time, letting several hours elapse between shakings. The solution is filtered, leaving laevulose. It may reach a more concentrated form by allowing the alcohol to evaporate.[79]

Later authors and colourmen recommend the following gum to sugar/honey ratios.

AH Church, *The Chemistry of Paints and Paintings* (1890:69-71), London, suggests a watercolour binder recipe of 1oz gum arabic to 2oz water, adding honey to counteract the brittleness of the gum.

Maria Bazzi, *The Artist's Methods and Materials* (1960:104), John Murray pub.), suggests 1 part gum arabic to 2 water as a watercolour binder, and that honey and sugar are added to make it more fluid and adhesive.

Hilaire Hiler, *Notes on the Technique of Painting* (1969:230), cites Coupils gum and water solution to increase suppleness and adherence of colours, gum arabic 3 parts, sugar candy or glycerine 1 part, melted in warm water to desired consistency. A little grain alcohol is then added and the bottle kept well corked.

R Mayer, *The Artist's Handbook* (1981:33), suggests as a binder for both watercolour and gouache paints the following:

2oz gum arabic/senegal
4oz water
1¼ fluid oz of honey water, diluted 1:1 with water
1½ fluid oz of glycerin
2-6 drops ox gall
¼tsp preservative

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[79] H Hiler, ibid p231.

Again, approximating a 3-to-1 gum to honey/glycerine ratio, though dilution with water at 4oz and the addition of such a quantity of glycerine increases the propensity for tints to wash up.

A handsheet from L Cornelissen and Son, Artist Suppliers, 105 Great Russell St, London (c1980s) suggests as a watercolour binder:

2 to 3 parts gum aratic solution (itself dissolved 1 part to 7 water)
1 part sugar/honey solution
a few drops of ox gall and glycerine

Approximating a 3-to-1 gum to sugar/honey but a weaker gum solution compared with some of the above.

Ludvik Losos, *Painting Techniques* (1987:50), Octopus Books, suggests a watercolour binder of:

gum arabic 26 parts
water 52 parts
glycerine 8 parts (1:1 solution with water)
glucose 10 parts
ox gall 4 parts

On page 59 he states, "Tragacanth is the most suitable binder for gouache", yet suggests:

100 parts gum arabic
200 parts water
40 parts sugar (or glycerine)
1-2 parts formalin preservative

for the same – approximately 2½ parts gum to 1 sugar, whilst the preceding approximated 3 to 2 respectively.

Very few, if any, modern watercolour recipes mention cherry gum but Lynton Lamb, *The Materials and Methods of Painting* (1970:80), London, notes that, "Cherry gum can give a great transparency but its glazes can be brittle" and suggests, to counteract this:

2 oz cherry gum
4 fl oz water
2½ fl oz of honey water, itself diluted 50/50 water
2 tsp ox gall

To recap, the trace-to-moderate amounts of sugar candy to gum arabic / senegal preparations, mixtures with cherry, tragacanth, karaya and other gums, and those found in the semi quantative GCMS analysis of Turner's paints, palettes and watercolours have been covered in the above experiments nos. 1-84, and figs. 102-103, 122, whilst gouache/bodycolour experiments follow this section.

In addition the same cover many of the late eighteenth / early nineteenth century recipes and commercial brands Turner and other artists used, as well as the more modern preparations, not to mention possible adulterations in gum supplies at source, market, or by colourman and artist. However this is not the full picture. What we have here is not only a reminder of the above but a refinement of the best in these experiments which incorporate plasticisers/dispersants in higher ratios to gum, particularly honey, in order to match closer Turner's paint films and effects.

One crucial discovery in the above trials was the effectiveness of a 1-part (teaspoon) arabic/senegal to 2, 2½, 3, 3½ teaspoons water ratio as a pigment binder. In addition, leaving the mixture to steep for 24 hours before preparation helps the gum to dissolve into the water and draws out its adhesive properties. Honey / sugar candy, like ox gall, can be added into the syrupy binder when mixing it with the pigment.

Flexibility is needed when measuring gum ratio to pigment. Gritty absorbent earth pigments and mars reds, for example, soak up more gum solution than the range of chromes; the latter produce a consistency similar to wet mud or soft butter. As Ormsby noted (June 1999), in the Roberson Archive gum varied from about $1/6^{th}$ of the recipe to equal to the pigment 1:1.

The above led to the following experiments to refine and improve the flow of paint from brush and its dilution and dispersal on the paper.

Firstly the dry pigment was ground for ¼ hour (2-3 tsp) in a pestle and mortar to remove any remaining coarseness in the particles.

1 tsp of gum arabic / senegal (powdered) was mixed with 3 tsp of water. 3 parts (tsp) of this solution was added to 1 tsp of honey/sugar, itself diluted 50/50 with water. Once added to the pigment, the paste was ground for a further ¼ hour in pestle and mortar with 6 brush (no. 4) drops of ox gall. Colour samples of this preparation can be seen in nos. 160-162 in the Conclusion, where they and the following examples show distinct differences between late eighteenth / early/mid nineteenth century recipes and modern Winsor and Newton / Rowney paint films nos. 158-159.

Since arabic 50% / cherry gum 50% (no. 77) had performed so well in comparative studies with the *Dark Rigi* (1842) (fig. 2) and the 110 Turner watercolours on display at the RA exhibition, further experiments with these gums combined with plasticisers/additives were carried out with some surprising results.

Cherry gum (Montpellier) dissolved 1 part to 7 water tsp, 80% of this mix plus 20% of arabic/senegal and 20% honey/sugar ibid ratio; can be seen in no. 163.

Cherry gum (Montpellier) 50% and arabic/senegal 50% plus honey/sugar 20% ibid ratios; see no. 164.

Cherry gum (Montpellier) 65% and arabic/senegal 35% plus honey/sugar 20% ibid ratios; see no. 165.

Gum tragacanth (1 part to 10 water) solution, 1 tsp, plus 1 tsp honey/sugar ibid ratio; see no. 166.

Gum tragacanth 60%, cherry gum 30%, arabic 10%, ibid ratios; see no. 167.

Cherry gum (Montpellier) 80% of a tsp plus arabic/senegal 20% to make up remainder of tsp, ibid ratios; 3 tsp of this mix plus 1 tsp of honey/sugar solution; see nos. 168, 169.

The same preparation was used to bind pigment that had been ground in a pestle and mortar for ¼ hour, and for a further ¼ hour when a liquid paste. 6 brushdrops of ox gall was also added at the latter stage. The results can be seen in nos. 170-172.

The above were getting closer by degrees at matching the gradations and opacities in many of Turner's paint films. After many painterly trials, the following recipe evolved:

2 tsp arabic/senegal (powdered)
1 tsp cherry gum (Montpellier/Aubenas)
9 tsp of water (the mix could still have absorbed at least another 3)

This preparation was left to steep for 24 hours. 3 tsp were then taken from it and added to 1 tsp full of pale, fluid, undiluted honey and ¼ tsp sugar candy.

Again, pigment was ground for ¼ hour in dry state in the pestle and mortar, and again when the binder was added, along with 6 brushdrops (size 4) of ox gall.

The results can be seen not only in nos. 173-175 in the Conclusion, but in the emulations of *The Dark Rigi* (figs. 140-142) and the two works from the *Campbell's* series (figs. 145-148).

In addition, this recipe was in line with a preparation in *The Strasburg Manuscript* c15th century;[80] it consists of the following:

> If you wish to make two really good mediums with which all colours may be tempered to make them beautifully bright, take, to start with, 2 parts gum Arabic and 1 part Cherry gum, and put these two gums in a clear bowl and pour over them pure water to cover the gum by a finger's breadth. Leave this to soften for about half a day. When the gum is well softened in the water, stir it well round with the finger till it is thoroughly mixed together. Then put a small potful of

[80] See VR Borradaile, *The Strasburg Manuscript, Translated from the Old German*, London 1966, pub. Alec Tiranti.

honey in this mixture and half an eggshell of vinegar. (p43)[81]

Not only did the above perform well in practice – subject to 200 washes of brushed water in wet up test no. 173 – it is interesting to note that the Strasburg recipe and the one cited in the footnote (see below) include cherry gum consciously and not as an accidental adulterant in gum sorts, with a reference to its strength and clarity. As we have seen earlier, cherry gum was noted for its harder, glassier, transparent effects.

Furthermore, cherry gum had not only been found in GCMS analysis of Turner samples, but in comparative studies by eye with no. 77, arabic 50% / cherry gum 50% and *The Dark Rigi* (1842) (fig. 2) and in many of the 110 watercolours on display in the RA exibition cited earlier.

As it happens, this two part arabic/senegal to 1 part cherry works out at an approximate 50/50 mix, since cherry gum absorbs more water by nature. The same recipe will also serve as a suitable gouache/bodycolour paint binder, which we will look at in turn.

An intermediate medium

Another method of achieving the vaporous translucent paint films found in many of Turner's watercolours is with the addition of a gum medium added to the paint on the palette.

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[81] In the same MS p65, the following recipe is given for a Watercolour Varnish: "…½oz of gum Arabic and ¾oz of either gum of the Almond tree or that of the Cherry tree. The former is stronger, the latter clearer. The two gums should be ground together and you must put them in the above mentioned white of egg and leave overnight to soften. Then grind it well together and add a paint pot of honey. Mix together … lovely, shiny and permanent."

Analysis of a jar of watercolour medium found in a Reeves box of paints circa 1800 was found to contain a mixture of arabic, cherry and tragacanth gum, possibly at 50%, 40%, 10% respectively (see no. 79).

Such mediums could easily be prepared by Turner or other artists, due to the flexibility of their ingredients. Added to the paint in small amounts, they will make for more transparent films or in larger amounts create buttery megilp textures of a rather gummy nature.

Making gouache and bodycolour like Turner's

The above experiments and GCMS analysis suggest that a whole range of possibilities exist for producing a gouache/bodycolour binder based upon those Turner used. A combination of gums arabic, cherry and tragacanth, their relatives and sugars used as additives have been tested; their strength and weakness examined.

Firstly, to recap, bodycolour is the mixing of opaque white, lead, barium (permanent white) or zinc (Chinese white) with transparent watercolour. See following bound with arabic:

85 Lead white mixed with Prussian blue.

86 Barium sulphate mixed with Prussian blue.

87 Zinc white mixed with Prussian blue.

88 Small section of lead white mixed with Prussian and yellow chrome showing textural contrasts in tone.

89 Attempt at emulating area of lake in *The Dark Rigi* (1842) (fig. 2) watercolour, using zinc Chinese white diluted in the water vessel to a milky consistency, a technique attributed to Turner.

90 Same as above.

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91 Same as above using barium (permanent) white – the colours here match fairly well those Turner used in this work but texturally it is not as close as paint bound with cherry gum (numbers 83, 84).

An experimental landscape composition demonstrating the adding of small amounts of lead and zinc white to transparent watercolour paint on the palette and in the water vessel, diluted to a milky consistency, a technique attributed to Turner, can be seen in fig. 123.

Gouache constitutes a high density of pure pigment mixed with gum to a creamy, syrupy texture. Some colourmen chose to add small amounts of opaque white, often lead or barium, during Turner's era and fullers such as china clay to their pigments and paints, not least gouache and bodycolour, to increase their opacity.

An experiment with additives and fillers

A range of fillers and additives obtained from colourmen suppliers and Sunderland Art College Ceramics Department were mixed with Prussian blue to test their effect; the best of them are listed here.

92 Chalk and Prussian blue – proved wholly unsuitable, inert and dragging paint films.

93 Alumina hydrate – dissolved easily, no surprising difference to the paint film.

94 Quartz – again no surprising difference to the paint film.

95 China clay – added slight texture and opacity.

96 Zinc white and china clay (latter 10%).

97 Marble dust mixed with cobalt and Prussian blues.

Turner watercolours containing gouache and bodycolour often have a coarse texture to their paint films. This can be due to the coarseness of grades of pigment, lead or

Fig. 123

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barium whites or the addition of fillers (at approximately 5-10%) such as china clay or marble dust and so on. However, the latter two do not add anything of importance to the paint's performance; it is the gum binders and their ratio to pigment which affect that.

Here it is worth noting that:

a) The preferred binder in modern gouache preparations is gum arabic. This makes for brittler paint films that wash up too easily when subjected to vigorous techniques, repeated soakings of water, paint, and abrasive brush work.

b) A gouache/bodycolour binder containing a mixture of arabic tragacanth (and possibly its cheaper substitute, karaya gum aka Indian tragacanth) and cherry gum were found in GCMS analyses of Turner paint films.

Experiments involving their combinations varied, with some ratios being more effective than others. For example, a combination of tragacanth 70-85%, karaya 10-15% and arabic 10-20% produced an effective gouache/bodycolour binder and can be seen in experimental composition fig. 103, but variants and refinements follow.

c) The blend of arabic/cherry gums, honey and sugar candy, seen in nos. 77 and 173-175 especially, will prove highly effective as a gouache/bodycolour binder. Preparing jars of paint with this blend enables the artist to dilute, strengthen or modify the gum ratio to pigment at will, as well as include other gums into the mix / on the palette, such as tragacanth.

d) An effective gouache mix which ensures a high pigment density is achieved as follows.

Ladle into a jar level teaspoons of pigment at a ratio of approximately 2-3 times to 1 gum. Mix and stir with a brush until a creamy, syrupy consistency is arrived at – it will be noted that tragacanth (or karaya) by their nature absorb much powdered pigment. If the mix approaches a thick, stiff, clotted cheese

consistency then truly a high pigment density has been achieved. Adding a little water into the jar, ½ teaspoon, 1 teaspoon or whatever, will take it back to a more syrupy texture.

Jars of bodycolour opaque white, whether lead, barium, zinc or their blends, can obviously be prepared in the above fashion. Some artists prefer to add opaque white into their jars of gouache to increase opacity, but using a jar of pure white bodycolour separately enabled the colours to be paled on the palette with a finer degree of tonal control.

e) A gum blend of tragacanth 30%, karaya 30% (both dissolved 1 level teaspoon to 10 water), cherry almond gum 20% (1 part to 7 water), arabic 20% (1 part to 3½ water), no. 78, was chosen for the following experiment because of its wide inclusive range of gums and to demonstrate the pros and cons of their characteristics in practice. Using this recipe, the following pigments were painted out flat and allowed to dry.

98 Cobalt blue.

99 Chrome lemon and orange.

When brushed with water, the above paint films remained quite stable, which obviously helps facilitate the layering of tint upon tint. The same paint, if diluted with water, will produce extremely translucent vapour-like films. Persevering with repeated washings of water on the dry paint films will create the finely dissolving distances and grainy texture attributed to Turner's watercolours, but not as easy as blends that contain higher ratios of acacia and cherry gums liquefied with honey / sugar candy.

When it came to emulating areas of *The Dark Rigi* (1842) (fig. 2), this recipe did not match the paint film textures as well as nos. 77, 173-175, arabic/cherry, honey/sugar blends. It was too powdery and starch-like in comparison, as the following demonstrate:

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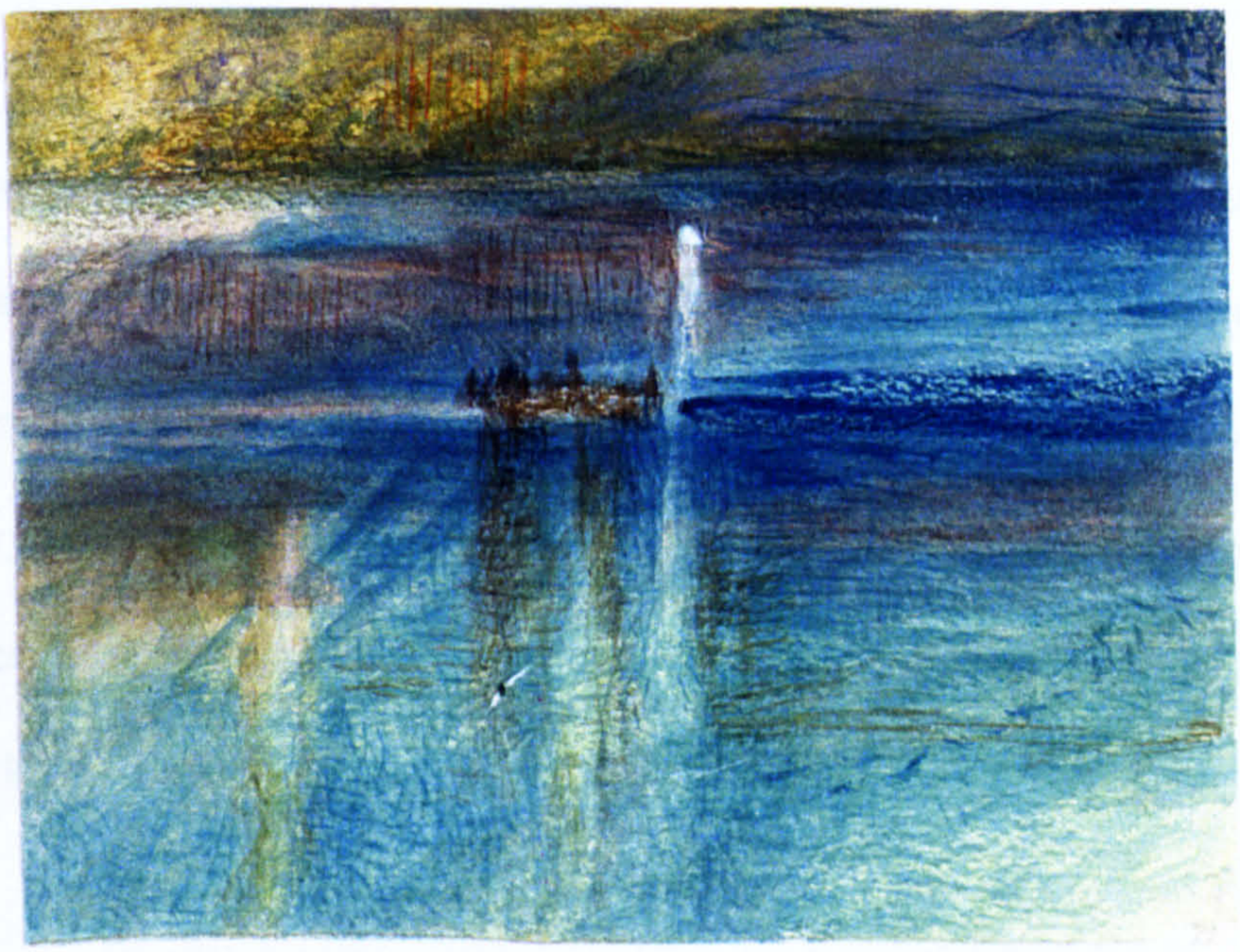

100 Rigi's peak.

101 Section of lake in *The Dark Rigi*.

An experimental composition using this recipe, in conjunction with other gums, can be seen in fig. 124.

Conclusion

Gum tragacanth is best used fresh as it will grow mould, often within a matter of 2-3 days if mixed with pigment and other gums and stored in jars. It soaks up powdery pigment particles, suspending them in an homogeneous gel that produces flat, matt paint films. It is diluted 1 part to 10 water, yet can take 15 to 20 parts water. More water reduces starchiness in paint films yet reduces its adhesion. Too brittle to be used singularly, it must be used in combination with other gums acacias, arabic, cherry and honey / sugar candy to produce a paintable medium that flows from the brush and disperses on the paper.

The above experiments have demonstrated that if more than 40% acacias/cherry blends with honey/sugar are used in the mix, tragacanth begins to lose its powdery influence on the paint film as the former adds gloss by degrees. As in all the above preparations, too much honey/sugar will increase the propensity of the paint films to wash up under successive washes of paint and water.

Experiments, comparative studies and GCMS analysis suggest Turner had a fondness for using tragacanth with other gums, especially in larger watercolours that mimic oil painting techniques, because of its tough covering power. However, arabic/cherry with honey/sugar blends flow, disperse, gradate and produce crisp, sharp details easier; they are also found in larger watercolours and more so in medium and smaller works.

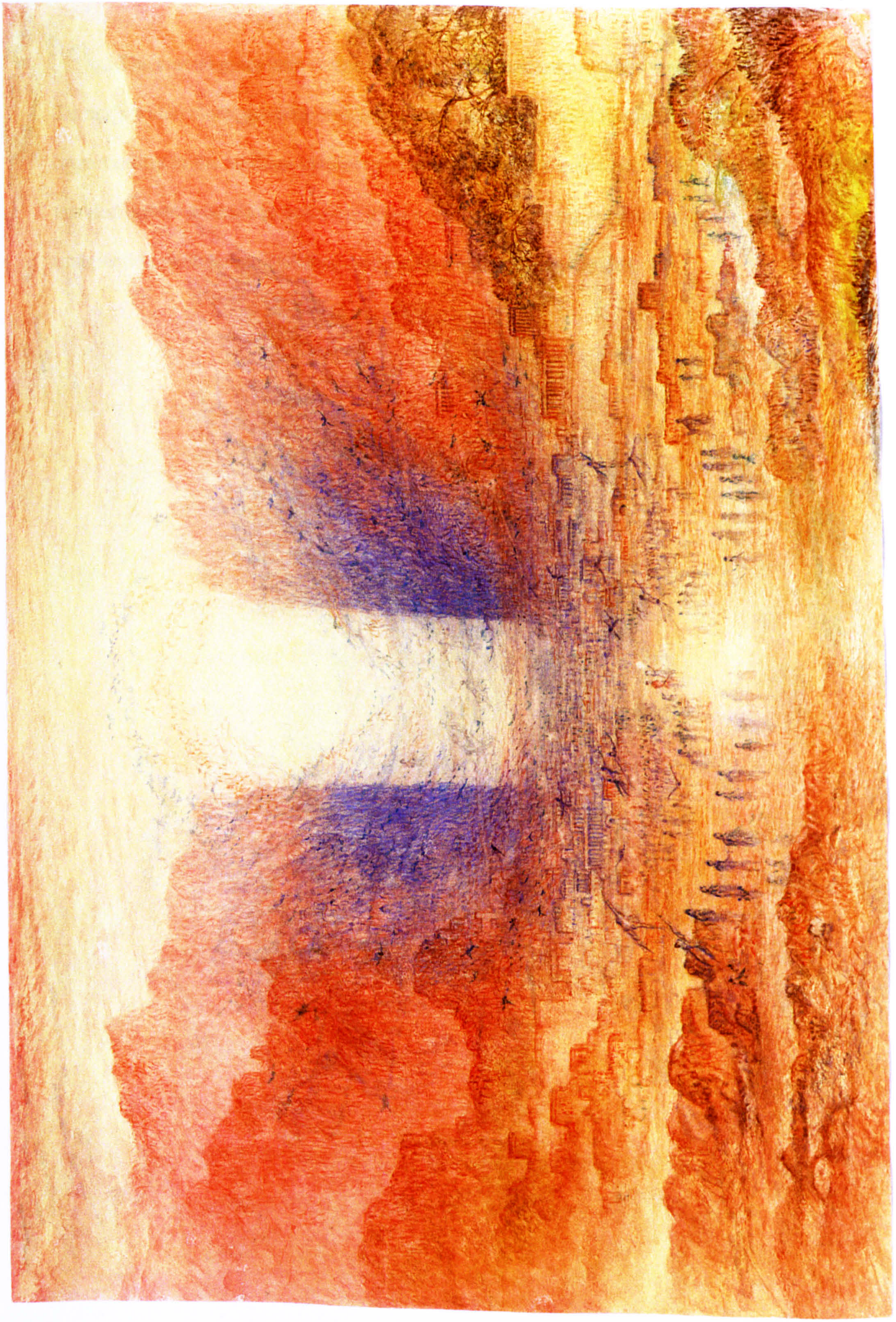

Fig. 124

The crucial point here is that the above gum binders and additives found in Turner's watercolour, gouache and bodycolour paints, provided him with technical opportunities in the medium that solely arabic based paints could not. Combined, they enabled him to produce an immense tonal range, matching the expanse of his imagination, with paint films that could adhere and lift when needed.

Appendix A

The vast majority of the following experiments were not as successful as those illustrated in the main text, though there are here many useful variants of the latter. Without some indication of their painterly performance, the examples would be almost meaningless; for this reason, brief comments are added to help the reader.

The same ratios of dilution stated earlier also apply here.

Experiments which include sarcocolla

Nos. 102) Tragacanth 60%, karaya 10%, arabic 15%, sarcocolla 15% - produced effective tints which did not wash up too easily.

103) Tragacanth 75%, saracocolla 25% - spread well, good adhesion of paint films, less wash up.

104) Tragacanth 25%, sarcocolla 75% - paint films spread well, still a bit starchy, more sarcocolla here acts like sugar and increased propensity to wash up.

105) Tragacanth 30%, karaya 30%, sarcocolla 20%, honey 20% - performed extremely well on wash up test, very effective, though a little starchy; may make a fair gouache/bodycolour binder.

106) Tragacanth 33%, cherry almond gum 33%, sarcocolla 33% - tough, strong translucent paint films, hardly any wash up.

107) Tragacanth 50%, cherry almond 25%, sarcocolla 25% - tough, strong translucent paint films, hardly any wash up.

108) Tragacanth 70%, cherry almond gum 10%, sarcocolla 20%, with a trace of sugar candy – tough, strong translucent paint films, hardly any wash up.

109) Tragacanth 70%, sugar candy 15%, sarcocolla – sugar candy levels appeared to encourage wash up.

110) Tragacanth 35%, karaya 35%, sugar candy 15%, sarcocolla 15% - dull, inert paint films, starch-like, washed up in parts.

111) Karaya 70%, sugar candy 15%, sarcocolla 15% - dull, inert paint films, also brittle, yet did not wash up too badly.

112) Sarcocolla 70%, karaya 20%, sugar candy 10% - produced translucent paint films, adhered well, but still a little brittle and inert, washed up easier.

113) Sarcocolla 70%, sugar candy 30% - washed up terribly.

114) Sarcocolla 30%, karaya 30%, arabic 40% - produced translucent paint films but still inert and washed up.

115) Saracocolla 50%, cherry almond gum 50% - brittle paint films washed up.

116) Sarcocolla 50%, cherry almond gum 25%, tragacanth 25% - improvement on previous experiment, washed up only slightly less with the addition of tragacanth, it also appeared to help facilitate transparent paint films.

117) Sarcocolla 70%, karaya 20%, cherry almond gum 5%, sugar candy 5% - paint films spread well, but still too brittle, washed up.

118) Sarcocolla 40%, tragacanth 50%, cherry almond gum 5%, sugar candy 5% - more useable paint films, did not wash up too badly, raising propensity of tragacanth helped.

119) Arabic 30%, karaya 30%, tragacanth 20%, cherry almond 10%, sarcocolla 10% - performed very well on wash up test, but paint films appeared a bit dull, boring, inert, not as fluid as they could be.

120) Arabic 60%, tragacanth 30%, cherry almond 5%, sarcocolla 5% - not too bad, tough, transparent paint films, did wash up more due to increase in arabic.

121) Arabic 70% , tragacanth 20%, sarcocolla 10% - washed up terribly.

122) Arabic 70%, tragacanth 10%, sarcocolla 10%, sugar candy – also washed up terribly easily and, like the previous, produced poor paint films.

123) Arabic 25%, karaya 35%, tragacanth 10%, cherry almond 5%, sarcocolla 25% - not too bad at tints and paint films a little powdery, performed fairly well on wash up test.

124) Arabic 35%, karaya 35%, cherry almond 10%, sarcocolla 20% - similar to previous experiment.

125) Arabic 35%, karaya 25%, cherry almond 10%, tragacanth 10%, sarcocolla 20% plus a brushful of sugar candy – produced matt starchy paint films, similar to previous two experiments.

126) Arabic 20%, tragacanth 15%, cherry almond 45%, sarcocolla 10%, sugar candy 10% - washed up terribly.

127) Arabic 20%, tragacanth 50%, cherry almond 20%, sarcocolla 10% plus a brushful of sugar candy – produced fluid paint films, adhered slightly better than previous, still washed up.

128) Tragacanth 30%, karaya 30%, cherry almond 20%, sarcocolla 20% plus a brushful of sugar candy – produced useable fluid paint films which adhered well, transparent and did not wash up easily.

129) Tragacanth 40%, cherry almond 30%, sarcocolla 20%, sugar candy 10% - similar to the previous, produced delicate tints, adhered well in wash up test.

130) Tragacanth 25%, karaya 25%, cherry almond 25%, sarcocolla 25% plus brushful of sugar candy – similar to previous two, not too bad at wash up test.

131) Tragacanth 20%, karaya 20%, cherry almond 30%, sarcocolla 30% plus brushful of sugar candy – similar to previous four experiments but washed up slightly more.

132) Arabic 35%, cherry almond 35%, tragacanth 15%, sarcocolla 10%, sugar candy 5% - paint films washed up too easily, due to sugar, nothing special.

133) Arabic 20%, karaya 20%, tragacanth 20%, cherry almond 20%, sarcocolla 20% plus brushful of sugar candy – disappointing paint films washed up.

Experiments without sarcocolla involving combinations centring around arabic, tragacanth, karaya, cherry gums, sugar candy and honey.

134) Arabic 80%, sugar candy 20% - poor paint films, washed up terribly.

135) Arabic 80%, honey 20% - again, poor paint films, washed up terribly easily.

136) Tragacanth 75%, honey 25% - produced tough paint films but too inert and starch-like, transparent tints though.

137) Karaya 75%, honey 25% - same as previous experiment.

138) Tragacanth 35%, karaya 35%, honey 30% - similar to previous two.

139) Arabic 40%, karaya 20%, cherry almond 20%, tragacanth 10%, sugar candy 10% - produced transparent paint films but washed up too easily.

140) Arabic 35%, karaya 25%, cherry almond 25%, tragacanth 10%, sugar candy 5% - produced transparent paint films but washed up a bit too easily.

141) Arabic 35%, karaya 20%, cherry almond 30%, tragacanth 10%, sugar candy 5% - produced transparent paint films but washed up too easily.

142) Arabic 35%, karaya 25%, cherry almond 20%, tragacanth 15%, sugar candy 5% - again, produced transparent paint films but washed up.

143) Arabic 20%, cherry almond 25%, tragacanth 30%, karaya 25% plus brushful of sugar candy – tougher paint films, adhered, faded less so than above four with wash up test, a bit starchy though.

144) Arabic 30%, karaya 30%, cherry almond 20%, tragacanth 20% - performed similar to previous experiment.

145) Arabic 35%, karaya 30%, cherry almond 20%, tragacanth 15% - paint films felt starch-like, too soft, washed up easily.

146) Arabic 30%, karaya 25%, cherry almond 25%, tragacanth 20% - same as previous experiment.

147) Arabic 30%, karaya 30%, cherry almond 20%, tragacanth 20% - produced paint films that spread but again washed up too easily – cherry almond preparation may not have been strong enough.

148) Arabic 35%, karaya 25%, cherry almond 20%, tragacanth 20% - minor variation on previous experiment still with similar results.

149) Arabic 75%, cherry almond 25% - produced useable paint films but not as good as a 50/50 mix, washed up easier than the latter.

150) Arabic 50%, karaya 50% - produced starchy paint films, performed fairly well in wash up test but other combinations preferred.

151) Arabic 35%, karaya 35%, cherry almond 10%, tragacanth 20% plus brushful of sugar candy – produced transparent paint films, not as tough as some other combinations, washed up too easily.

152) Arabic 35%, karaya 30%, cherry almond 15%, tragacanth 20% plus sugar performed as previous example.

153) Arabic 35%, tragacanth 35%, cherry almond 15%, karaya 15% plus brushful of sugar candy – performed slightly better, if at all, to the above two.

154) Tragacanth 50%, karaya 20%, cherry almond 15%, arabic 15% - increasing tragacanth and karaya ratio produced tougher paint films, albeit a little starch-like.

155) Fresh cherry gum, reddish colour (Durham University, Botanic Gardens) – produced transparent paint films, though a little draggy, pulling on the brush, not as flowing as it could be, though ox gall added in small amounts can help this problem. Adhere exceptionally well on wash up test but dirty cast to the paint films due to the gum absorbing pollution.

156) Cherry gum (Durham) 50%, arabic 50% - performed as the previous example only the inclusion of arabic increased solubility of paint films.

157) A Roberson (1840) recipe for a watercolour medium involving 2 parts distilled vinegar to 1 part gum arabic proved too brittle; the paint films washed up easily.

Chapter VIII

Painting Turner watercolours:

Cracking the code of Turner's techniques in the medium

Beginning with technical and material observations gleaned from several Turner watercolour exhibitions, and more detailed studies and emulations of his works in collections at the Clore Gallery, London, Laing Gallery, Newcastle and National Gallery, Edinburgh, this chapter will attempt to take the reader to the heart of Turner's watercolour practice. Moving through a detailed step-by-step emulation of his work will, I believe, help explain the complex interrelationship between Turner's ideas, tools and techniques which enabled him to become so prolific and innovative in the medium. Indeed, attempting to emulate Turner's watercolours has proved to be the most effective way of finding out what they are and, taken together, each work discussed covers the full range of his style and techniques from the simplest to the most complex.

However, cracking the code of Turner's watercolour practice is one thing but more important is what we do with it. In broad terms I hope that the following will inspire others, no matter what their activity or discipline, to move from the mere appreciation of other people's work they admire towards developing their own self-found knowledge. Such was at the heart of Turner's practice yet it has remained a neglected part of his legacy.

The crucial point here is that Turner knew no matter how much knowledge gathering he was engaged in, it counted for nothing unless his own ideas and feelings were realised in his own work.

The watercolour *Whitby* (1825) (fig. 125), on display in the Turner Watercolours exhibition, Agnew's Gallery, March 1994, and one of the *Ports of England Series* will serve as an introduction, being among three works I attempted to emulate on Gerard's sixth batch of paper using gum-arabic based paints. The other two watercolours, *Dartmouth Castle on the River Dart* (1822) (fig. 126) and *Dover from Shakespeare's Cliff*, (circa 1825) (fig. 1) share many of the techniques outlined in the following.

Whitby (circa 1825)

To begin with, the lightweight paper Turner selected for this work (most likely made by Whatman) has a smooth, hot pressed surface with a slight texture to it.

The basic forms, the cliffs, the sand, sea, sky and so on, are established primarily with barely perceptible translucent tints. Either a finger, a piece of rag or brush could have been used to shape and model them. Turner appears to have laid these and successive tints in a fairly relaxed manner; my own efforts were far busier and more intricate on first attempt than need be. The distant cliff and abbey retain the preliminary tints of an extremely diluted gamboge hue, built up tonally on the cliff top, whilst very translucent Prussian blue has been applied with the point of a brush to draw like a fine, sharp HB pencil the details in the abbey, cliff face and the buildings at the bottom of the cliff. Once again these details, incorporating stipples and hatchings, have been controlled tonally in broadly three stages: (i) extremely translucent marks; (ii) a mid tonal range which Turner spends a lot of time dextrously modelling; (iii) the final touches of opaque colour.

Turner's skill lies in their combination, varying the pressure of his brush and working with the surface texture of the paper. Dense tonal areas have been built up

Fig. 125

Fig. 126

through successive layers of translucent tints with stipples, hatchings and other marks sandwiched in between and on top of the paint films, particularly on the cliffs, sand and sea.

In many areas the paint has been played around with and modelled to express form and effect. In addition the point of a clean, damp brush has been employed to cut back through top tints to the undercoat especially on the waves and foam in the sea.

An immense amount of fine drybrushing has been applied in nearly every part of the picture. The drybrushing - predominantly Prussian blue and mars red/orange of varying density and dilution - is achieved by drying the brush loaded with pigment on a rag and then lightly dusting the surface with the bristles to leave behind particles of colour.

Turner also employed spontaneous touches of colour with immense precision to establish fine details, such as the figures salvaging logs on the shore and other marks in the sea, sand and cliffs which indicate form and motion. Such marks cannot be achieved by laboured processes. Only by trusting your instincts and your first touch will you hit the target once and forever.

The translucent qualities of pigments such as Prussian blue and gamboge yellow - even when mixed with the grittier earth pigment yellow ochre for the sand - are more suited for layering, sandwiching and cutback than the more opaque pigments vermilion, burnt sienna and so on. This is because Prussian blue and gamboge, by virtue of their translucent qualities, gradate more easily. Gamboge has a natural gummy base and Prussian blue as a colour still retains its tinting power when diluted. Thus a tonal range can be achieved from a barely perceptible tint through to the depth of the colour in cake form. A dense earth pigment such as yellow ochre can be made more transparent with the admixture of gamboge. In sum, combining a naturally

translucent pigment with a dense opaque, one achieves the best of both worlds. Furthermore pigments such as mars red/vermilion, Prussian blue and yellow ochre remain crisp and opaque when painted in minute stipples and hatchings; they may be applied translucent with the addition of more water to pigment ratio, or opaque by adding a small amount of lead white or barium sulphate.

Through Switzerland with Turner exhibition, Clore Gallery, London, 20 April 1995

This exhibition provided a vivid insight into the preliminary studies and experiments Turner produced as rehearsals for his finished watercolours.

Evident throughout the works on display was Turner's use of barely perceptible tints and washes of colour to establish his base coats. They provide a different surface, full of incidents and accidents, to work upon than the paper's naked texture. Matched with the film of pigment and gum binder, they serve to strengthen in some degree the working surface, as well as providing a translucent foundation to build upon.

Another revelation was the way Turner had flooded the paper with both transparent and opaque paint, often blending and driving them around to express an idea in mind. In many circumstances it appears as if the paper had been used as a palette, there is so much loose and vigorous activity. See, *Scene in the Tyrol* (1843) (fig. 127), *Martigny* (1841-1842) (fig. 128), *The Village of Fluelen* (1844-1845) (fig. 129), *Arth* (1842-1843) (fig. 130) and *Ehrenbreitstein* (1841) (fig. 131).

During the heat of practice, Turner obviously put in as much as he could in a single throw. The movement of his mind is captured in the paint as he tries to fix an impression or idea. He makes the most of any accident or incident in the paint,

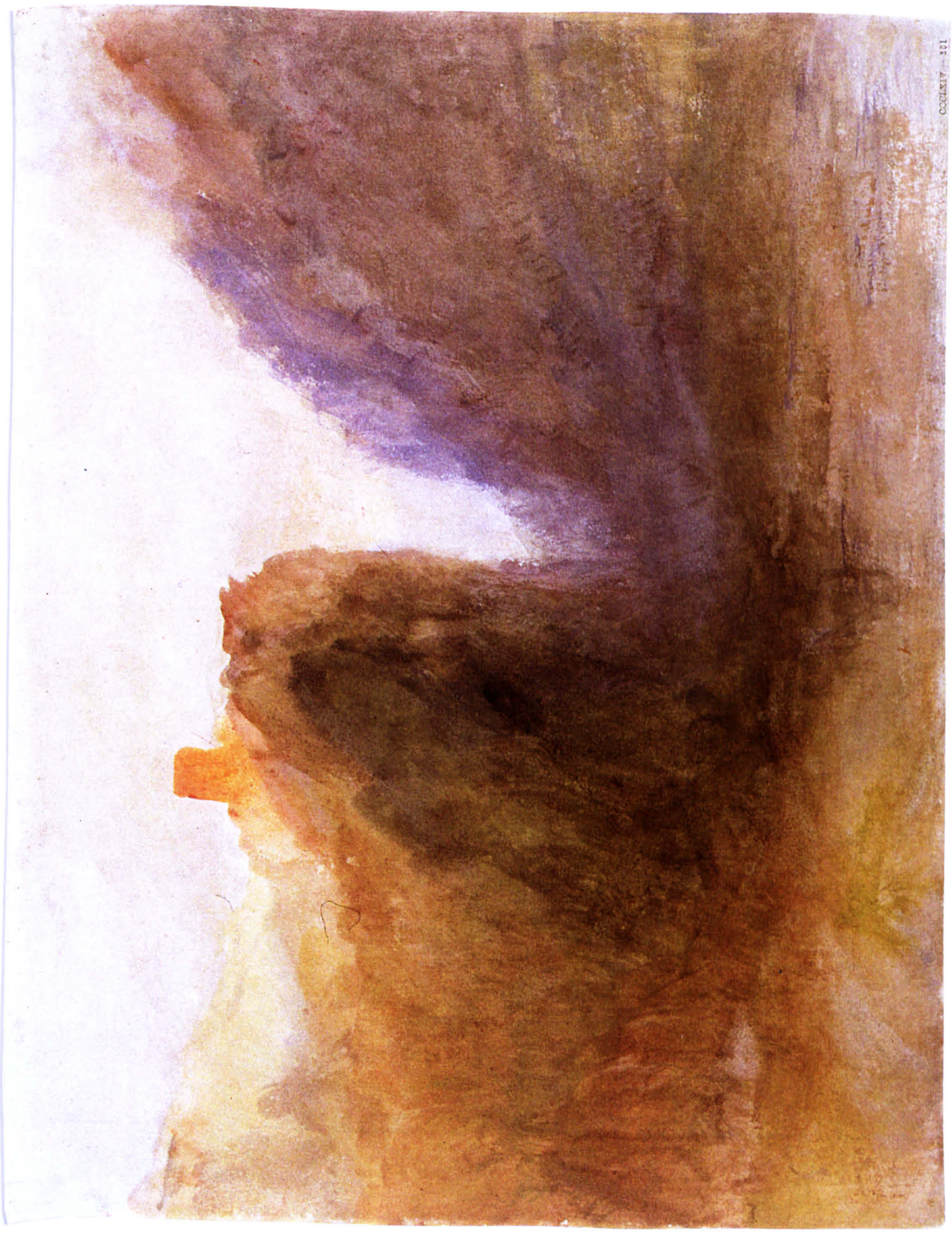

Fig. 127

Fig. 128

Fig. 129

Fig. 130

Fig. 131

exaggerating heights, angles and colour as he saw fit. If a dash of paint began to take on the appearance of a cloud or a cluster of buildings, he built upon it, all the while varying the scale of mark-making with the point of his brush and carefully avoiding mannerism and repetitive patterns –the kiss of death for a composition.

Any structured ideas he had absorbed on colour or art theory went into the background of his mind during practice. He relied on his own instincts to harmonise colour as he played around with the fluid paint. For example, as well as using primary colours singularly, he creates subtle blends and variants of the same hue by modifying a Prussian, cobalt, ultramarine or indigo blue with different combinations of each other and in different densities of transparency and opacity. Any colour could be modified in this manner.

Indeed Turner produced many of these works when at home, just leisurely experimenting and playing with the paint after drinking a generous allocation of rum or sherry.

Turner and the Scientists Exhibition, Clore Gallery, London 28 April 1998

Having successfully produced with John Gerard (papermaker) a handmade paper based on samples Turner used in the 1820s and a range of watercolour paints based on late eighteenth and early nineteenth century recipes, it was possible to compare the results to date at the above exhibition.

Among the many watercolours on display were *Arundel Castle with Rainbow* (circa 1824) (fig. 132), *Dartmouth on the River Dart* (1822) (fig. 133), *Shields on the River Tyne*, (1823) (fig. 134) and *Kirkstall Lock, on the River Aire* (1824-1825) (fig. 135).

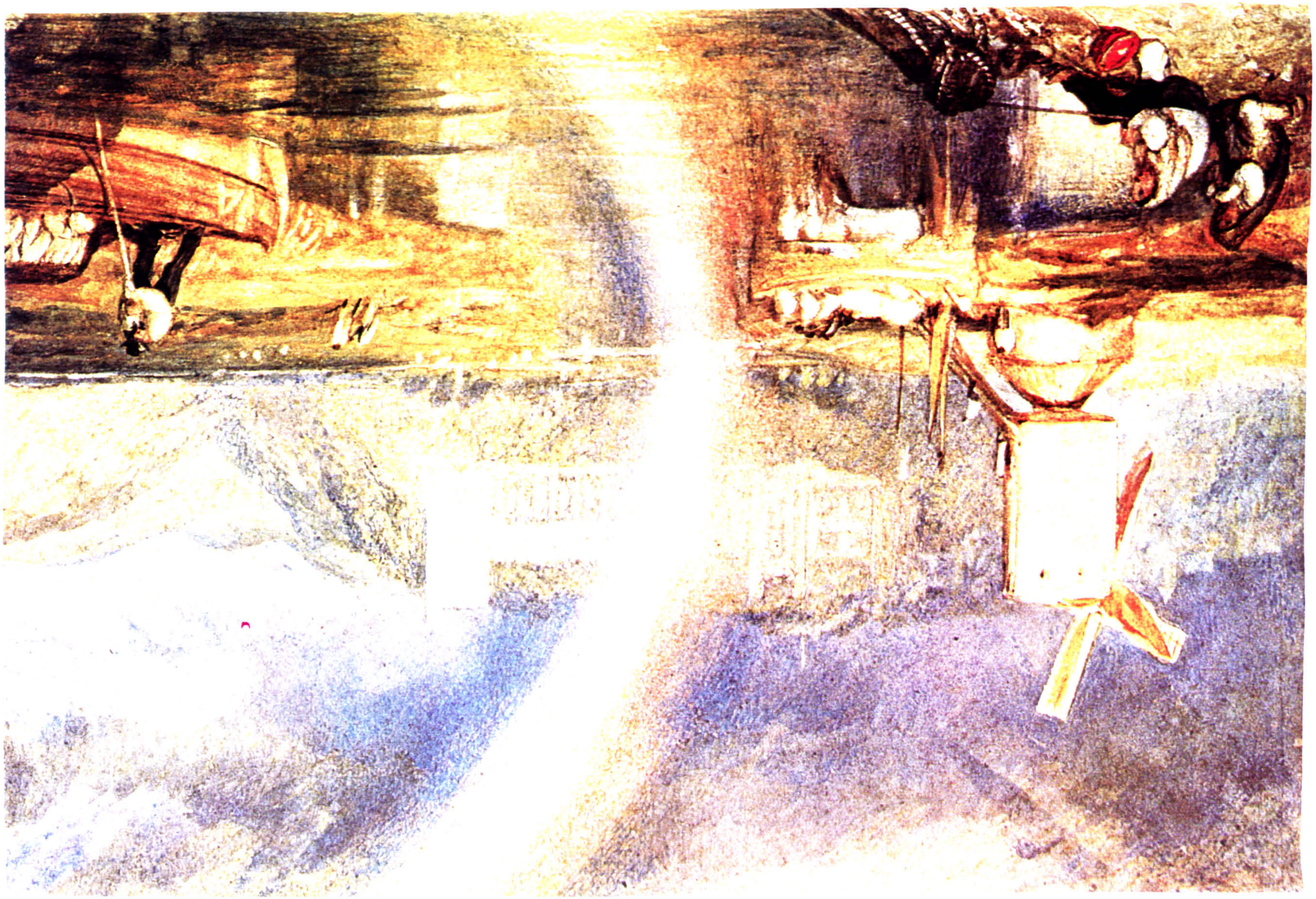

Fig. 132

Fig. 133

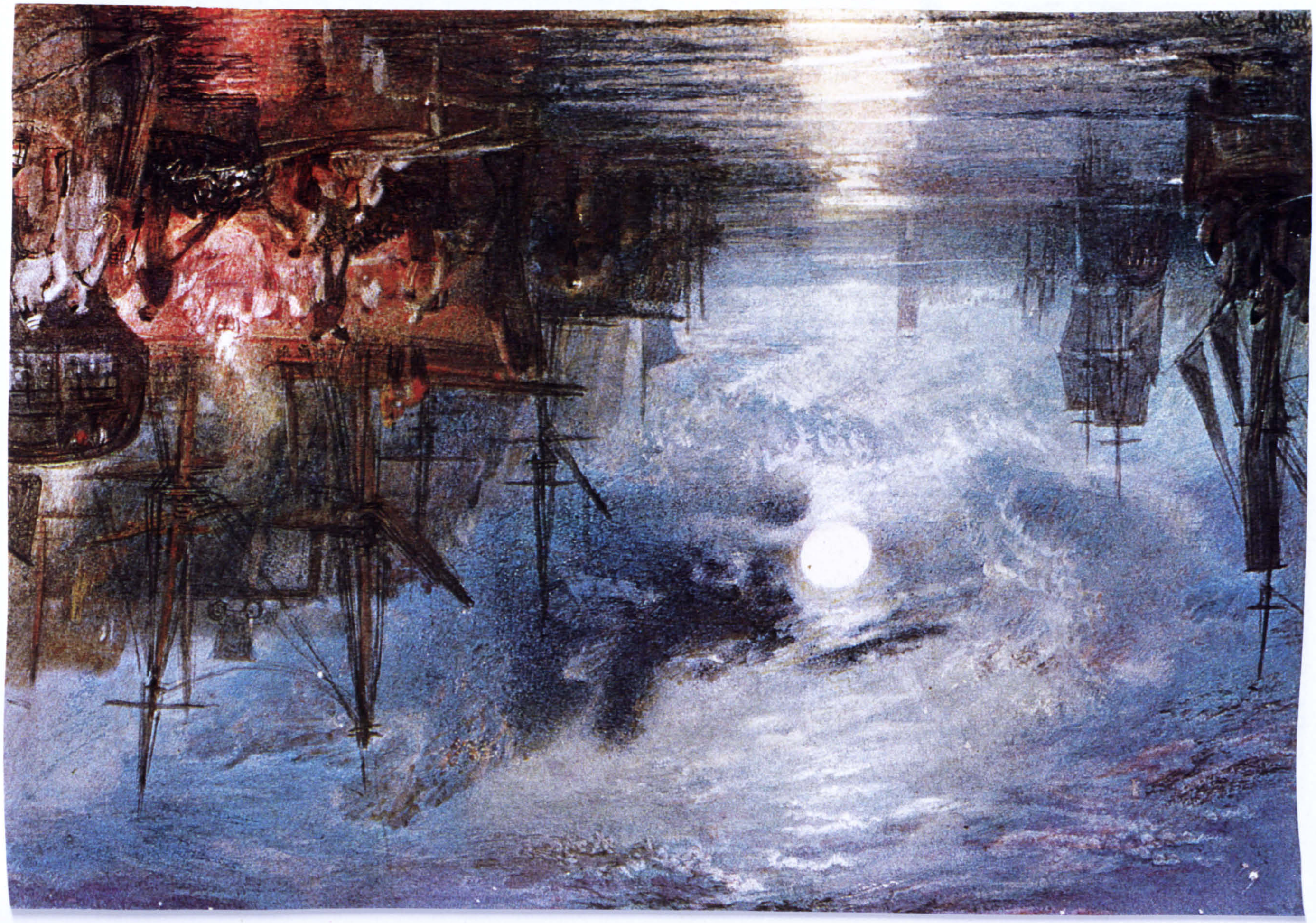

Fig. 134

Fig. 135

In the Clore Gallery study room, both Peter Bower (paper historian and forensic analyst) and I compared samples of Gerard's seventh batch of paper, with and without watercolour on its surface, alongside Turner's watercolour *Norham Castle* (1823) (figs. 3 and 4). As the *Norham Castle* watercolour was in an open mount and not fixed in a glass frame, a close comparison was possible. By holding them up to the light, the translucent qualities and fibre characteristics of the two papers could be examined. Their surface texture and grain appeared to match quite closely and light passed through both sheets without any evidence of foreign bodies or clumps of ill-formed pulp. In addition the surface texture of Gerard's paper appeared more multifarious than the papers in Turner's works on display. This was a major improvement on Gerard's previous batches.

One subtle difference between Gerard's paper and those Turner had used was that the latter possessed a slightly smoother surface texture. This had been achieved by the glazing and finishing process. However, stretching paper for watercolour painting also smoothes out the surface to some degree and subjecting Gerard's paper to the same glazing and finishing processes would produce the same results. In sum, a whole range of surface textures are possible on such a paper as they were during Turner's era.

Next, Bower and I discussed the watercolour techniques used in the works on display, and specifically the *Norham Castle* (1823) work.

Crucially the Prussian blue, yellow ochre and vermilion/mars red I had made (see fig. 96) matched the colours Turner had used. However there were still some subtle differences in the consistency and behaviour of the paint which I would discover later could be emulated by using a range of pigment binders such as cherry

gum, tragacanth, as well as gum-arabic and additives including honey and sugar candy.

We will now look at the *Norham Castle* (1823) watercolour in some detail.

In the constellation of Turner's creative life, it was the North Star of *Norham Castle* to which he attributed so much of his good fortune as a painter.

His first visit to Norham took place in 1797 when he was 22, resulting in the 1798 watercolour he exhibited (see fig. 17) at the RA, which helped trigger his career as a painter.[1]

The place continued to fascinate him throughout his life and inspired six more important and spectacular works, including an oil masterpiece in 1840. He returned to Norham again in 1801, making a series of quick pencil sketches. The studies (see fig. 136), along with the 1797 sketches, provided a source for the 1823 version of *Norham Castle*.

Norham Castle (1823) (figs. 3 and 4)

Norham Castle (1823) is a self-contained watercolour essay which describes many of the techniques found in Turner's work in the medium. Crack the code of the materials and techniques Turner employed in this work or indeed *The Dark Rigi* (1842) (fig. 2) - which will be discussed later – and you crack the code of his practice.

Since his watercolours are, on balance, far more technically complex than his oils and have remained largely unfathomable for nearly a century and a half, this is an

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[1] Hill, in *Turner in the North* (1996:88), states:

> In 1831 Turner revisited Norham on his way to Scotland to make illustrations for the work of Sir Walter Scott. He was travelling with Scott's publisher, Robert Cadell. As their coach made its way up the hill past the castle, Turner took off his hat and made a bow. Cadell was puzzled and made enquiries as to the meaning of this odd gesture: "Oh", was the reply, "I made a drawing or painting of Norham several years since. It took, and from that day to this I have had as much to do as my hands could execute".

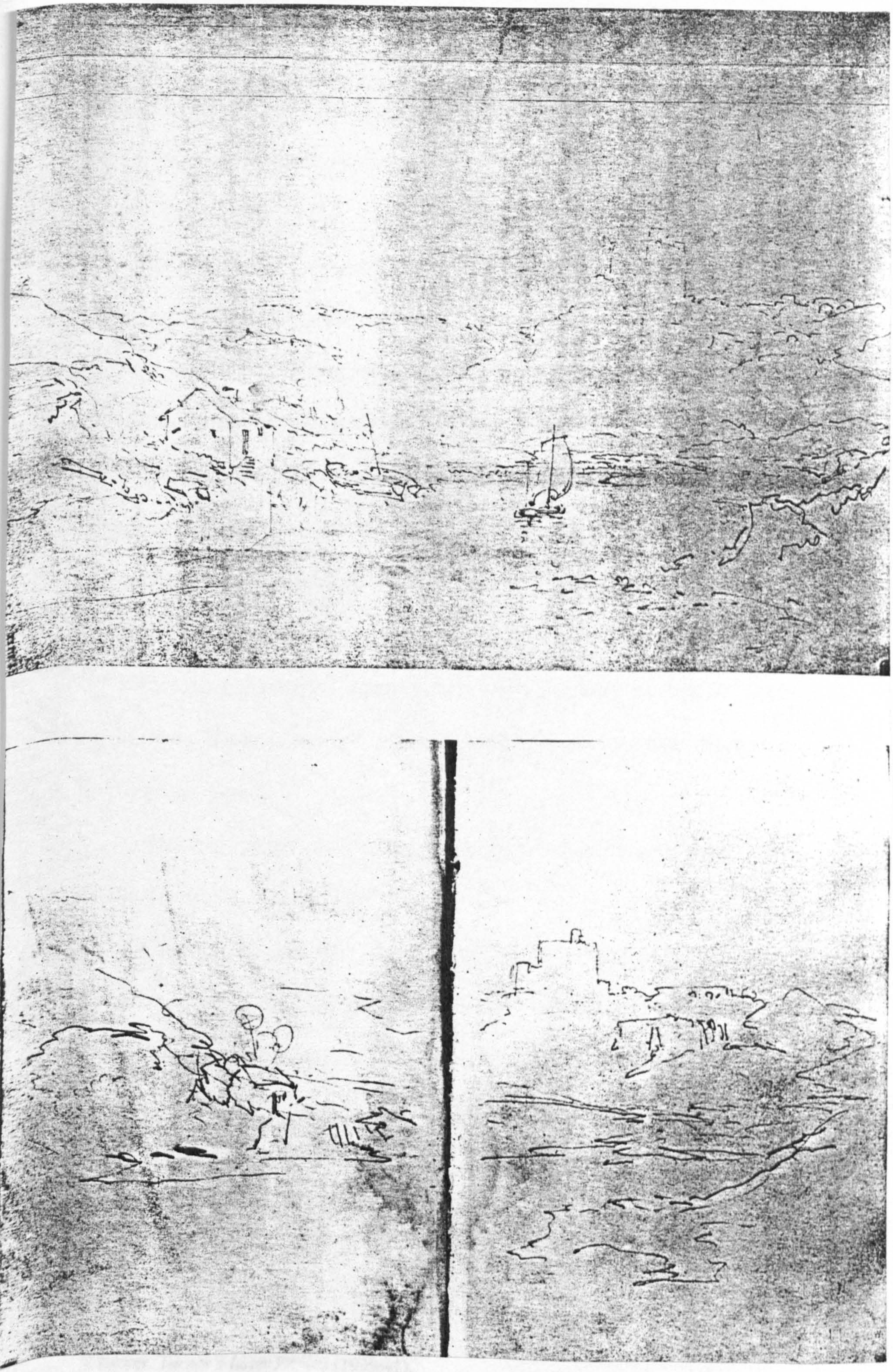

Fig. 136

immensely worthwhile activity. Several of Turner's interpreters, historians and critics have discussed this work[2] but none have attempted to emulate it in order to find out what it is nor build upon the knowledge this work or the others outlined herein contain.

To begin with, it is most likely that the paper *Norham Castle* (1823) was painted on is a Bally Ellen and Steart white wove handmade.[3] The surface texture of the paper has become an integral part of the work; as we shall see, Turner has kept in touch with his base throughout whilst he built up the image.

<u>The preliminary tints</u>

Mixing separate amounts of yellow ochre, a pinkish red (madder or mars red) and blue (either a combination of Prussian and cobalt or a natural variant of ultramarine), he dilutes them into an almost barely perceptible consistency, knowing that the eye will search and find their tints amid a complex range of deeper tones once the image progresses.

Beginning with yellow ochre, he lays in the salient forms, the castle, contours of the hill, terrain, river and sky.

Once dry, he reinforces their details with successive tints of the same and introduced the pinkish red in the bargain. All the while he proceeds with the point of a brush and an extremely light touch to model the paint in order to express the vaporous forms in the sky, the contours on the hillside, details on the castle, terrain, figures,

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[2] See WG Rawlinson; AJ Finberg, *The Watercolours of JMW Turne*r (1909:28-38), which traces the development of the image; David Hill, *Turner in the North* (1996:88-95); and *A Taste for the Arts; Turner and the Patronage of Edward Lascelles of Harewood House* (TS Vol. 5, No. 1: 36-40). GE Finley, *Two Turner Studies, A "New Route"* in 1822 "Turner's Colour and Optics", *Journal of the Warburg and Courtauld Institute (*1973:385-390). J Gage, *JMW Turner, A Wonderful Range of Mind* (1987:88-91). M Kemp, *The Science of Art* (1992:292-302).

[3] P Bower, *Turner's Later Papers* (1999:41).

cattle and their reflections in the river.

Tints of blue, of the same strength and pigment loading are modelled on top of the yellow and pink base, bringing their tones into play as much as possible. The effect can be seen particularly in the left side of the castle and parts of the sky and river. Crucially he applies no more paint than is necessary in these areas.

The mid tonal range

Having established and exploited the lightest tints possible, he now enters the crucial mid tonal range. This constitutes the tints and marks sandwiched between the undercoat and the final touches and it is where some of his most complex skills take place.

To take a step up in the tonal scale he loads his brush with a slightly denser liquid blue paint than used during the preliminary tints and proceeds as follows. With the point and sweep of the brush, he traces and lightly models the contours and crevices on the hillside, castle and some of the blue shadows on the river, bringing the undertint into play as much as possible. Once dry, areas are washed with brushfuls of water to create a grainy texture.

Then, using a drybrush loading of blue, he proceeds as if producing a fine HB pencil drawing to embellish details. Depths of shadows created by the crevices, the resulting contrasts of tone and textures in the contours of the hill, castle, terrain and the reflections and refractions in the river are established with finely drawn marks, stipples, hatchings and minute fragments of colour painstakingly executed and applied very, very slowly.

These marks are crisp, sharp and powdery in appearance; some are drybrushed with hardly any water in the paint, others appear to contain very small amounts of

white (probably lead white) which produces a slightly lighter opaque blue. Both tones intermingle in some areas following on top of where the translucent undercoats indicate; at other times they counterpose the preliminary tints. By virtue of their imposition, juxtaposition and tonal colour contrast, they create a sense of oscillating movement in the paint and form, particularly in the blue hillside, castle and central reflection which dominates the picture. In some parts of the hill, castle, terrain and river, Turner has employed the point of a clean, damp brush to cut back through the compound of opaque colour to reach the undertint – in effect, stipple and hatching in reverse.

At the far ends of the hillside, both left and right, and on parts of the castle, the three oblong openings and beyond, atoms of blue paint, crisply applied, gradually disperse amid modelled translucent tones and areas of cutback – combined, they capture the penetrative effects of light on dense material.

Breaking down colour into such fragments is ideal for depicting minute changes and gradations inherent in nature's phenomena. Throughout the picture, the surface of the paper has remained firm and stable; it has not broken up as many modern papers would, creating instead of crisp sharp details, soft woolly effects.

<u>Establishing the buildings, terrain, river, reflections, figures, boats and cattle</u>

The small stone building on the left consists of a light undercoat of yellow ochre that reflects through and between patches of a light tertiary grey modelled on top; the effect is of stone itself. The roof has a base tint of mars/madder red with bars of translucent blue-black carefully paced on top. These bars cast sharp shadows on one side of the wall and they have been established with two to three tones of grey whilst glints of white on the corner of the wall frame the effect. The same blue-black

tint diluted is used at the point of a brush to build the modulation and steps in the smaller stone wall – again over the top of extremely translucent yellow ochre. A darker tone of blue-black – the consistency as used in the bars on the roof – draws the final details on top of the small wall where it joins with the terrain and around the two bars of wood resting on the smaller portion of wall. The final marks have been applied, drybrushed with hardly any water in the paint to maximise their opacity and crispness.

The wall above the head of the kilted fisherman has a base coat of light yellow ochre rubbed into the grain of the paper with a brush or finger to create texture and minute highlights. Next, a translucent glaze of blue-black is applied and allowed to run and form a little shadow next to the fisherman's tam. The glaze has also been modelled to allow small glints of the wall to show through. A triangular white shape which penetrates into this section of wall to the edge of the paper has been modelled in the same fashion, without yellow, using an imperceptible glaze of blue-black, rubbed and reinforced in areas with the point of a brush.

The yellow hill above the small fisherman standing on the left-hand side of the wall, and the shoreline all receive a light tint of yellow ochre. Again, this tint has been rubbed into the paper's surface with a brush or finger in some areas to expose the paper's grain in order to reflect light and make the colour livelier and depict textural effects. In other areas, he has let the yellow settle undisturbed. Marks of translucent blue and red-brown paint and opaque drybrushing have been carefully employed to model the shoreline whilst the point of a damp brush has lifted colour and scratched out further details and lights in this area.

The floating shape belonging to the fisherman on the left is an opaque mid-tone yellow ochre with light red-brown on top and in the reflections whilst the main

details, coils and shadows are light and dark blue-black marks that extend into the fisherman's figure, line and reflection. The next boat near the shore is built with red-brown flat tints and embellished with crumbly blue-black details and reflections. The third boat in the distance, moored beside some rocks, is of the same colour but glazed with blue and black lines, the latter opaque and dry, pick out its details and reflections. The rocks, like the terrain leading to them, have a base of light ochre with white areas picked out with the point of a brush, blue glazes, drybrushed texture and finely drawn crevices.

The dark blue opaque terrain behind the building is achieved by sandwiching layer upon layer of translucent tints with stippled and hatched fragments of semi dry paint.

The trees and waterwheel on the other side are established in much the same manner but are surrounded and penetrated by atoms of blue and light suspended in a vapour of varying densities and gradations. Beneath this area is the preliminary ochre tint modelled as the terrain on the opposite side with glazes of blue-black, some light touches of red-brown and scratching out.

The boat off-centre and the one in the dry dock on shore are of the same colours, dark brown with black details that spill out and gradate into their reflections and shadows.

The cattle grouping is as complex as any part of the picture. Their features, including muscle and bone structure, are finely drawn in light ochre, red-brown tan and black. The same colours are reflected in the river, stippled, hatched, dragged and translucently layered.

The reflections and refractions of colour in the river

The base tint is almost imperceptible; successive paint films have been carefully applied without disturbing any of the advantages gained by the undercoat. There are areas which have been rubbed with a finger or brush to expose the surface texture of the paper and capture the effects of raking light.

Next, translucent blue, red-brown and yellow marks - some layered as ripples on the river, others indicative of forms on the shore - are painstakingly applied with the point of a brush.

Additional highlights have been scratched and washed out with the brush to reach the undertints. Combined with the above techniques, they capture all the iridescent complexity of reflected and refracted colour in the river.

The colossal blue shadow that dominates the centre of the picture consists of the same techniques used in the contours of the hill and castle – immense stipples and hatchings in translucent and opaque drybrushed colour. Turner never seems to lose sight of the yellow base tint or the surface texture of the paper; they are brought into play as much as possible. The blue reflection gradually tapers out and its faint echoes reach the edge of the paper – an essay in gradation itself.

Summary

To achieve the intricate and luminous effects which Turner has in this work is as much a product of a mental attitude as it is of tools and technique. It is crucial to bear in mind the scope of the tonal range in tints and marks the tools will allow.

I believe most people attempting to replicate such a work using contemporary papers and paints would produce a watercolour within a range of five to ten tints and

thereby reach the final details and darkest tones far too soon. Turner's skill lay in the fact that he could produce a range of twenty-five or more tints and tonal marks.

As he proceeds from the lightest tints and marks of colour through to the mid tones and the final touches, he brings to bear the whole arsenal of his techniques, and in different combinations. He has no settled or systematic process; if he felt an experimental technique might produce the idea in mind, then he would try it. It is crucial to make the paint work the way you want it to, driving, modelling and playing around with it, using the side or point of the brush to produce the effect. Translucent, wet or drybrushed opaque paint, sometimes with small amounts of white bodycolour mixed in, maybe modelled on damp or dry paper and rubbed, stippled, hatched and glazed, and so on.

Another favoured technique is similar to that used in the production of extremely fine HB pencil drawings – in effect finely drawing the idea in mind with a paint brush.

Some of the effects I had attempted to emulate with immense laboured detail, such as in the contours of the hill below the castle and their blue reflections in the river, Turner achieved with the careful layering of tonally gradated tints. He allowed the transparencies offered by the medium to do the work as far as it could by exploiting the surface texture of the paper. As the paint settles on the multifarious surface, ready-made stippled tints are produced, suggesting form and further elaboration. Indeed, a technique often evolves the more you apply yourself and become absorbed in the work. It was such an attitude that helped Turner avoid his fear of mannerism and mappiness, and one of the reasons why his work often appears different each time the view looks at it.

The Lloyd Bequest Exhibition

The following brief notes taken from the *Turner Watercolours* in the Lloyd Bequest exhibition 14 September 1998, British Museum, I believe confirm his fondness for mixing bodycolour/gouache with transparent watercolour paint in many of his works. Here there are six examples spanning four separate decades.

Turner's early watercolour *St Erasmus in Bishop Islip's Chapel, Westminster Abbey* (1796) (fig. 97) comprises of precisely mapped lines and flat translucent tints, yet with a body to them.

Rosehill, Sussex (1816) also contains flat translucent washes. The light blue sky is seemingly achieved by mixing Prussian with opaque white; it disperses into fine gradated tones. The trees especially contain a very flat matt yellow ochre.

Marxbourg and Brugberg on the Rhine (1820) (fig. 99) – once again very flat and matt paint films, though the composition is not staid but painterly. The washes are allowed to settle and find their limits before details are worked on top of them. There are touches of deep gouache about the picture. The grain of the paper looks largish, certainly larger than in the sheet *Norham Castle* (1823) (fig. 3) is painted on. *Prudhoe Castle* (1825) (fig. 18) contains the full range of Turner's techniques in the medium. The transparencies produced by watercolour paint are evident in the base coats, the sky especially. The paper's surface texture has a largish grain or nap to it but it is not coarse or rough. Like the previous works, there is plenty of bodycolour/gouache on top of slight, translucent stains of watercolour. There are minute touches of gouache in the foreground and opaque white highlights.

When it comes to mark-making, it appears anything goes as long as it produces the effect Turner has in mind.

Florence (1827) (figs. 7 and 8) is a very gouachey picture, the trees and foreground especially. The distant blues look like powder over the translucent preliminary stains of watercolour that make up the sky.

Lake Nemi (1840) (fig. 11): the paper appears quite coarse in surface compared to works in the *Harbours, Rivers and Ports Series* (see figs. 125, 126, 132, for example), among others.

A pattern emerges inasmuch as Turner lays in the base tints with stains of translucent watercolour, particularly in the sky. A mixture of watercolour and gouache can be seen in the mid tones and the marks of paint on top of them. The hills on the left in particular contain much scumbling and draggy drybrushed paint.

The contrast of watercolour and gouache assists in creating tonal depth and force to the image. That Turner could blend the two so easily and effectively without muddying their tones suggested gum binders other than arabic were at work.

Turner's *The Dark Rigi* (1842) (fig. 2): some views

Gemma (age 10) Sunderland: "I like the different textures, the colours and the way he's done the little figures."

Victoria Bryant, language graduate, Blyth (age 22): "It looks like a dream."

Two construction workers, Newcastle (late 30s, early 40s): "Is this THE Turner? – You can see he's working from lights to darks."

History of Art postgraduate, Trinity College, Dublin: "I wish I'd spent more time in practice than theory."

Turner fan (in his 40s) Newcastle: "Who's to say what it is that Turner could not do?"

Museum attendant (in his 50s), Sunderland: "Turner, I can't see what all the fuss is about."

Young woman, second year Philosophy student, Durham University: "Turner? No, I haven't heard of him. I am a Philistine."

Martin Hardie, in his *Watercolour Painting in Britain*, Vol. II "The Romantic Period", (1967:40), commenting on the *Rigi* series, stated:

> ... those two masterpieces *The Rigi at Sunset* and *The Rigi at Sunrise*, known as *The Red Rigi* and *The Blue Rigi*. In making drawings of this kind other painters may bore us with their mechanism and dexterity, but Turner never lost impulse and pictorial harmony. In the Rigi drawings he was the insuperable master of technique. He used every possible manipulation of brush, colour and paper, every device, every weapon in his armoury, sponging, rubbing, washing, stippling, hatching, touching and retouching, to express the vibration and radiation of light. Like Shelley, he saw in Switzerland mountains 'mingling their flames with twilight'. Light was his theme. Sometimes it may seem the light that never was on sea or land, but, like the poet's dream, it may make a picture more living than life. Someone who knew Turner's ways said that 'he had seen the sun rise oftener than all the rest of the Academy put together'. While Constable painted mid-day and afternoon, Turner studied the miracle of sunset, when all nature is hushed and gilded in transient gleams quivering through a film of russet or smoky gold, and the more rarely seen miracle of dawn, when life that has been passive and suspended begins to glow with a new faint flush like a child waking from sleep. That tender opalescence of sun-filled haze is what makes his Venetian, his Lucerne and other Swiss drawings so poetic and so memorable.

On page 42, Hardie summarises in broad terms the style of Turner's late watercolours:

> These final works are based on vision – with all that the word implies of inner guidance and emotion – rather than on visual observation. In his hands matter is becoming miracle. He had shown all that could be done in the way of chiaroscuro and realistic representation. He had used light to separate, sharpen, set into relief, all the shapes and complexities of the objects in his landscape. He is now showing what he can do with the intangible and impalpable. Light now penetrates every object, breaking up the solids till they become semi-transparent, and flooding them with mystery. He is no longer concentrating upon foreground dimensions, but is gazing through space into deep, airy distances. His visions of Swiss valleys and Venetian lagoons flutter into a radiant existence like the may-fly emerging into sunlight from its enshrouding husk.

"I cannot tell why Turner was so fond of the Mont Rigi, but there are seven or eight more studies of it among his sketches of this period. This one was realised for his own pleasure in 1842. The drawing is in my possession." – Ruskin, referring to *The Red Rigi*[4] (see fig. 137).

The Dark Rigi (1842) (fig. 2) is among three finished watercolours inspired by the atmospheric shifts on Mont Rigi, Lake Lucerne, Switzerland, its two companions being *The Blue Rigi* (figs. 5 and 6) and *The Red Rigi* (fig. 137).

The Mont Rigi, a favourite tourist destination, could be seen across the lake from the windows of the Swan Inn Hotel, where Turner stayed during 1841. The reader will recall in Chapter V eyewitness accounts of Turner's rapid sketching methods during his Swiss tours and the above works were developed chiefly from a series of impressive colour beginnings (see figs. 138 and 139). They provide a vivid insight into how Turner structured and planned his work simply by playing around with the paints, experimenting with the transparencies and opacities of the medium, till he felt satisfied to proceed with the final composition.

The Dark Rigi, like its companions, was conceived and executed when Turner was in his mid-sixties and at the height of his power. He had a lifetime of ideas and practical knowledge to draw upon yet there is nothing formulaic about the work; Turner still explores uncharted waters on Lake Lucerne. It is a masterpiece in the medium and no one before or since – and that is over a century and a half – has produced a comparable work.

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[4] See Ian Warrell, *Through Switzerland with Turner* (1995:70-71) on *The Dark Rigi* (1842) (especially p75, Tate Publications). For more on this subject and others in the series: Russell and Winton, *Turner in Switzerland* (1976, De Clivo Press); M Lloyd, editor *Turner* (1996, National Gallery of Australia) includes two accounts; Gage, *A Watershed in Watercolour* (p100-127) and Irena Zdanowicz, *The Late Swiss Watercolours* (p128-143). Gage (1987:61-64); Shanes, *Turner The Masterworks* (1989:38-40); Wilton, *Turner Abroad* (1982).

Fig. 137

Fig. 138

Fig. 139

To begin with, the paper *The Dark Rigi* is painted on is a lightweight (around 90lb), probably made by Bally, Ellen and Steart;[5] its surface is rather smooth, hot pressed in texture (see fig. 85) and may be deduced from the edge of the sheet as visible on the display mount.

That Turner could produce such an immensely detailed work on a relatively thin paper without it breaking up is yet another testament to the papermaker's skill as well as his own. I found this to be evident when attempting to emulate *The Dark Rigi* on a 1980s Arches 140lb cotton based paper. When subjected to repeated soakings, layerings of watercolour and vigorous working, the surface broke up easily and produced blurred woolly effects instead of crisp, sharp details. In addition, the paper absorbed the watercolour paint, producing duller tones than those found in Turner's painting (see figs. 68 and 69). Further experiments carried out on contemporary Saunders, Waterford, Fabriano and Whatman papers produced similar results, suggesting that a reversal of papermaking technology had taken place since Turner's era, the consequences of which severely constrained the range of techniques and expression possible in the medium. Though Turner could produce a watercolour with just about any paper and paints, when it came to creating a masterpiece such as *The Dark Rigi*, he made specific material choices, as the following will demonstrate.

As for the paints employed, my experiments and the analysis by Vallance/Ormsby outlined in the previous chapter confirm that solely gum-arabic based watercolours could not produce this image and many of those outlined herein.

Instead, a whole range of gums, arabic, cherry, tragacanth, and their relatives, are needed in order to make paint binders capable of producing such an image. In

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[5] Personal communication, Peter Bower.

addition, plasticisers and dispersants such as honey, sugar candy and ox gall are crucial to the mix.

The Dark Rigi **(see figs. 140-142)**

In the first instance the sky has been laid with a dense central tint of a light/mid chrome yellow which gradates into lighter tones as it disperses to the top of the paper, the tip of the Rigi and the east and west extremities. If Turner had not achieved the desired tonal effect in the first throw, then once dry, successive tints of the same loading, no more than one or two, would achieve the same result.

Next, almost imperceptible washes, stipples and touches of a chrome red tone have been applied with the point of a brush above the Rigi's terrain on the left, to indicate the effects of refracted light. The same marks are applied on the far bottom right of the sky, just above the floating mist.

In the top left- and right-hand corners, extremely dilute tints of blue (a Prussian/cobalt mix achieved the same colour) are lightly painted and gradate inwards and downwards towards the light source.

Loading the brush with slightly more of the same blue, flurries of vaporous clouds are delicately painted on top of these corner tints and in other areas of the sky, especially above the terrain on the left where they intermingle with the earlier red marks. Crucially these marks are translucent and allow the undertint to show through.

The white sunburst consists of light tones of opaque white (lead) drybrushed – or a Gibraltar white pencil – the dense touches are applied lastly at the centre, whilst the whole gradates at its extremities.

Patches of translucent blue are carefully and cunningly interwoven into the depressions created by the drybrushed white, providing a multitude of contrasts to

140

Fig. 141

Fig. 142

enhance its luminosity. There is also a dusty drag of white atoms amid the granulated tints of red and blue on the Rigi's peak, suggesting it was applied near or at the end, as a final touch to the composition.

A few opaque touches of mars red, blue and yellow can be seen in the top centre of the sky. These red stipples and marks are gradually diluted with water to fade into the ether. In sum, the sky appears to breathe and palpitate as tint permeates tint, the watercolour applied as if it were vapour itself.

<u>The central form of the Rigi</u>

The Rigi itself is composed of successive undercoats and barely perceptible tints of (i) chrome yellow (ii) chrome/madder red (iii) cobalt and Prussian blue.

Turner certainly makes the uttermost of each successive tint and wash, exploiting their transparent tonality to the full. On top of a light chrome yellow, a red tint followed by a blue one forms the apex of the Rigi. Once they have dried, an effect of penetrative light on dense material has been achieved by gently rubbing the top layer of paint with a damp finger, rag or clean brush to expose granulated particles of red from the undertint.

To establish the form and contours on the Rigi, small washes of translucent blue have been modelled with the point of a brush, shading and drawing in paint. They appear soft and wet as transparent watercolour can, even after it has dried for over 150 years, yet once drybrushed particles of a darker blue are applied on top of them at a later stage, the techniques are indistinguishably blended.

Mid tones

Next, slightly deeper, opaque tints of blue are applied in specific areas and dextrously shaped and modelled, tracing and defining forms. Turner often brings the undertint of faint red into play and in some parts a hint of yellow ochre is also present. Using the point of a clean damp brush to cut back and model in reverse is achieved whilst reaching the undertint. These washes and touches of paint constitute the mid tones. Paradoxically they appear complexly modelled and economically executed at once – less can mean more. A lot of action is suggested in the paint through merely letting a small wash or touch of paint find its own limits; it does not always have to be so busily worked or fussed.

Drybrushing

A dusty drag of drybrushed blue has left its minute atoms on top of the above tints. They create a powdery, pastel-like appearance to the Rigi. For this effect to be successful, the brush must be loaded either with transparent or opaque blue, depending on the density required, and dried on a piece of rag till there is seemingly no water left in the paint. The brush is then gently applied, to dust the surface where required.

Stipple and hatching

In addition, stipples and hatchings, ranging from the extremely dilute and translucent to a deep opaque blue, are employed at the point of a brush to reinforce and counterpoint the forms and contours where seen fit.

Some of these marks are as fine as human hair, or a sharp HB pencil line, gradating in terms of the brush sizes 0000, 000, 00, 0 and 1.

The dense terrain on which the Rigi rests consists of an opaque tint of yellow ochre painted over the top of a light chrome yellow undercoat. This band of colour is about one and a half inches high and as it progresses from left to right, it gradates into a translucent red, then into a deeper tone which dissolves in the centre of the picture at the bottom of the Rigi. This red – a chrome or madder – matches the second undertint in the Rigi's form and has been applied once the band of ochre has dried.

Turner has rubbed and drybrushed the ochre in parts to create granular textures indicative of distant details and dissolving forms in the terrain. At the same time, he has picked out lights, cutting back to the undertint with the point of a brush, particularly on the summit where it is penetrated by sunlight, and in the bottom left corner which is well worked.

Many of these highlights and cutbacks have been augmented and reinforced with fragments and touches of draggy drybrushed colour – mars red, brown, cobalt and Prussian, placed contrastingly at their edges and amid the granular texture.

Flurries of vaporous clouds and broken bands of mist float and progress tonally over the top of the yellow sky just above the edge and the terrain itself. Some are transparent, others semi-transparent cobalt and drybrushed. They are painted amid an extremely minute band of translucent and opaque stipples of mars/chrome red – some the width of hair strands. The effect indicates the dispersal and aerial refraction of light at sunrise. This action triggers a mass of transparent and opaque blue stipples which descend like a legion of aerial demons, extending from the far left into the centre of the Rigi, to surround the vaporous ball of mist. Here, darker Prussian blue is mixed into the stipples to define, through contrast, the vapour. These stipples range from brush sizes 0000 to 2 in width, some are soft and translucent in appearance as they hold water, whilst others crisp, sharp and drybrushed, seemingly pure pigment

with hardly any water. In addition, minute atoms of a dry, dusty drag of cobalt and Prussian has been applied on the band of terrain, extending into the Rigi.

Lastly, in the central part of the terrain, a stippled and hatched arc of opaque, almost impasto'd dark Prussian has been painted. The marks fan out in multifarious directions, yet remain within the compass of the arc; their echo, reverberation and energy can be seen in other parts of the picture.

The far right of the Rigi

Three planes of terrain form the far right of the Rigi. They contain the same base tints and techniques described in the Rigi's central form - only the plane nearest the lake has a more predominant light red base tint - yet in the final instance it is so well worked it appears indefinable in colour.

A mist creeps in between these three planes of terrain for about a third of the picture from the right edge of the paper. It has a base tint of translucent light blue (Prussian and lead white) on top of which fine drybrushings of lead white have adhered. Further drybrushings of white have been applied in specific areas to coagulate with the previous coat. They produce broken areas of deep opacity, indicative of a dispersing milky vapour.

In this, the final third of the Rigi's terrain, the drybrushing is immense amid washes, minute and larger touches of dry colour, stippled, hatched cutback plus further translucent tints.

The large rolling cloud of mist in front of the Rigi has a light Prussian blue base tint, with some yellow ochre present at the edges and scattered amongst it. Its form has been sculptured with scumbles, impasto's and drybrushings of opaque white. Once the mist has been modelled, dabs, drybrushings and minutes stipples of light

Prussian blue have been dextrously interwoven to reinforce shadows, highlights and edges. Perpendicular and horizontal fractured marks of blue (opaque Prussian) can be seen at its tail end; some float up on to the Rigi's form. Also explicit in this section of the picture is Turner's intermingling of opaque white with his other techniques. It can lead the artist out of trouble or into it, if not handled sensitively.

The lake from left to right

A flesh-coloured undercoat constitutes the base tint of the whole lake (yellow ochre mixed with lead white and a touch of lemon chrome achieved this tone).

Beneath the terrain the Rigi rests on, a series of translucent tints of Prussian blue are applied. They gradate downwards in transparency towards the bottom of the lake, making a space like an inverted 'V' for the central light. These tints are not totally uniform but broken like the rippled surface of the lake. They create Prussian green tones as the undercoat transmits through the thin paint films.

Just above the boat with the white highlight, to the left, there are complex layers of translucent ochre, Prussian green, blue and russet madder red intermingled with opaque tones of the same. Lead white has been used to lighten the blue on the lake behind and in front of the white sail. Just behind this area to the edge of the paper, lights have been picked out with the point of a bush. Opaque touches of drybrushed bright mars red/vermilion and Prussian/cobalt have been stippled, hatched and fragmented in horizontal and perpendicular marks in a spontaneous fashion.

The boat itself consists of dark opaque brown reinforced with blue-black details on transparent undertints of the same. The highlight is drybrushed white, its reflection gradates and disperses downwards towards the boarders on the jetty.

The section between the boat and jetty which extends towards the central light is extremely complex, perhaps the most complex part of the picture. Here, once the preliminary tints have hardened, Turner proceeds to capture the effects of lights' reflection and refraction on the lake with a matrix of translucent tints and touches of colour consisting of the following:

a Prussian green painted on top of c yellow ochre	b Prussian blue painted on top of d russet red (madder)	both lightened themselves with yellow ochre

a, b, c and d are mixed and blended with and into each other with tints, stipples, hatchings and glazings that refract and reflect each colour to make up the mid tone.

Each of the above are, it appears, in parts lightened with lead white, small amounts of which could be added on the palette.

To complicate matters further, mid tone washes of Prussian blue-green spread downwards from the level of the boat, dispersing their influence. Here Turner picks up on each incident and accident, reinforcing them with further tiny washes, tints, stipples and hatchings and minuscule drybrushings. Thereby reflections and refractions of colour are defined, creating in total an iridescent effect like hundreds of ghostly figures materialising on the surface of the lake.

<u>The jetty and figures</u>

The jetty and boarders are established in a fairly straightforward manner, though the area as a whole appears extremely complex.

(i) Thin dilute washes of mars red-brown draw the figures and jetty.

(ii) Drybrushed opaque touches of the same reinforce their forms, including faces, shadows in the clothing and details on the jetty. Underneath, streaks of drybrushed Prussian mingle with brown to represent ripples on the lake.

(iii) Further highlights are picked out with a clean, damp brush, particularly on the figures.

(iv) Mars red-brown provides the base tint for the boat. A dark opaque brown umber is painted on top. This mid tone of umber spills into the boat's reflection and is gradually diluted – a whole blot of it in the foreground.

Turner cleverly reinforces the boat and reflection with an opaque black shadow, mimicking its form and contrasting with the light reflected on the lake. This shadow is reduced in size by a second and third reflection.

In sum, this area, like the confused mass of boarders and luggage, has been established in a loose calligraphic style. Further pools of mars red-brown lay at the bottom left edge, whilst black and dark brown is used to define edges and details. Lastly, fractured lines and squiggles of the same colours realise the reflections.

<u>The sun's reflection in the lake</u>

Shaped like an inverted 'V', this section is as complex as any other part of the picture. The flesh colour that constitutes the base tint can still be seen intermittently between the following techniques.

At the apex, light touches of opaque white mingle amid the top band of gradated Prussian blue-green. This area is finely gradated with further stipples, hatchings and scumbles of Prussian blue-green.

As the reflected light fans out towards the edge of the paper, minute and broken soft green and blue touches of scumbled paint are laid to indicate its iridescent

dispersal. On top, a dusty coating of drybrushed white has been intermittently applied. Broader translucent sweeps of blue-green paint, some an inch in length, are added to establish ripples on the lake. They are reinforced with minute transparent and opaque stipples and hatchings of the same colours.

At the very bottom, broad sweeps of opaque white, red and brown settle amid softer transparent tints of the same.

In sum, each section appears to contain the whole range of Turner's techniques in different combinations and varying degrees. The flesh coloured based tint becomes so modified visually by these superimposed tints and marks that it is hard to identify and define it as a separate colour.

<u>The final sections of the Rigi and finishing touches</u>

On the lake, below the arc in the terrain, a band of dark Prussian (opaque), over an inch deep, grainy in texture, which may have been rubbed with a finger, extends towards the rolling cloud of mist. There it dilutes in tone and carries on to the far right edge of the paper, just above the two small boats.

Below the arc, a thin brushstroke of opaque white has been painted in the middle of the band of blue to lighten its tone and echo the sun's reflection in the lake. Once dry, another strand of drybrushed white has been applied to highlight the tone.

Strands of deep Prussian are painted and scratched from the edge of the arc in the terrain where it meets the lake, towards the rolling cloud of mist. Stipples and drybrushings of the same, mingled with red-brown can be seen at and below the edge where the mist disperses on the lake.

To the right of the boat, at the top left of the picture, a swift brushstroke of dark opaque Prussian leaves its fragments on the surface, a few of which emanate

downwards towards the jetty. A single strand of the same blue is streaked across the apex of the sun's reflection on the lake. To the left, perpendicular marks of the same tone are applied; heavier touches to the right towards the long streak of white foam and mist mingle with red-brown.

Above the top two boats on the far right, further tints and stains of Prussian with the odd touch of red (madder/chrome) have been laid. Their appearance is of soft, wet paint, modelled and rubbed with either brush or finger, yet they still maintain enough transparency to enable the undercoat to show through.

Once dry, the complex mark-making begins; drybrushing, scumbles, stipples, hatchings and other marks pick up on the suggested ripples, reflections and forms in the paint. Turner also goes in with opaque lead white where need be, with slight touches, glazings and drybrushings.

The three boats have a mars red-brown base tint, the details overlaid with dark opaque Prussian, almost black in parts. The deep reflections from the boats are established with the same Prussian modelled in soft washes. Once they have dried, they are reinforced with the same colour again, only deeper in tone, drybrushed, stippled, hatched, with small squiggles, flurries and flexible bars of opaque Prussian; lights have also been picked out with the point of a brush to add to the complex tonal interplay.

The elongated trail of vapour and foam leading from one of the top two boats has been established in much the same manner as the above rolling cloud of mist. Opaque white bleeds into a Prussian light blue and green base tint. Concentrated drybrushed white has been dabbled at the very centre of each incident in the vapour, whilst minute glazings of light blue shadows mingle.

Forwards from this boat, beneath the vaporous foam, the flesh tint underglaze can be seen through slight Prussian green and yellow tones, their washes soft in appearance.

Paradoxically, these marks and glazings have a translucent yet opaque appearance due to their finishing with dusty atoms and minute stipples and hatchings of almost dry colour.

The bottom right-hand corner of the lake consists simply of opaque lines of a dark mars red mingling with Prussian, with plenty of drybrushing to establish the ripples on top of the fleshy undertint. The odd wet brush has been applied here and there to re-soak and disperse some marks to suggest fluidity.

In the far right-hand bottom corner of the picture, he draws with simple, straightforward lines of dark mars red-brown a small platform, a jetty of logs and figures; touches of dark blue reinforce these marks, highlights with a damp brush.

Conclusion

On first impression, everything painted in *The Dark Rigi* appears dry, dusty and opaque, not soft, blurred or watercolourly. Yet paradoxically many of the opaque tints and marks possess a degree of translucency about them; they allow the undertint to transmit through in parts.

In *The Dark Rigi*, there is no bare paper showing through the paint and opaque lead/zinc white has been used for highlights in the sky and on the lake, and perhaps a Gibraltar pencil.

It is clear that *The Dark Rigi*, like its companions in the series and other works such as *Prudhoe Castle* (1825), *Lake Nemi* (1840) (see figs. 18 and 11) could not have

been produced solely with gum-arabic based watercolour paints or on poorly sized cotton-rag-based papers.

Instead Turner used handmade, linen rag-based, gelatine sized hot pressed papers and a range of gums in combination to bind his pigments. Gums-arabic, cherry, tragacanth, and possibly some of their relatives, mixed and employed singularly enabled him and would enable us to produce the wide range of techniques and effects described herein; the rich intensity of tone found in so many of Turner's watercolours is especially characterised by their combination with plasticisers honey, sugar candy and dispersant ox gall.

Crucially these gums facilitate a subtle blending of transparent and opaque paint which, combined as they are in the heat of practice, makes their separate identification difficult and the following techniques possible.

The preliminary tones consist of the lightest translucent glazes and stains of watercolour possible, often delicately gradated, a technique he adheres to throughout.

Sometimes he allows a wash of colour to find its own limits as it gradates, unfussed and receiving no further working. On other occasions he builds upon incidents and accidents caused by the way the paint disperses or settles on the paper. Such may be worked upon with further tints or touches of paints whilst still semi dry to achieve certain effects – a cloud burst, for example. Generally however he waits for the undercoat to dry before proceeding to apply layer upon layer of colour to build up density of tone.

As he progresses, the mid tones are manipulated, modelled, rubbed, scratched and played with to realise forms observed or imaginary.

In some areas of the picture, such as the top of the lake, the paint appears to have been lashed around in a workmanlike manner, using the paper as if it were a

palette, stopping once a spontaneous effect is realised or triggers an idea in mind. Knowing when to stop and what to leave out is as important as knowing what to include. As Sir Joshua Reynolds is reputed to have said, "Simplicity is an exact medium between too little and too much".

Crucially Turner often leaves his opaque tones translucent enough in parts to enable the undertint to transmit through and light enough in colour for superimposed darker marks to have an effect by virtue of their deeper contrast. The texture of opaque paint enabled him to realise oil techniques in the watercolour medium.

The powdery pastel-like appearance to much of *The Dark Rigi*, and many of his other watercolours, is created by washing out and immense delicate drybrushing. These techniques were mastered by constant practice. Loading the brush with nearly-dry paint, then wiping the bristles on a rag till there is hardly any water left in the paint, he proceeds to lightly dust the surface and leave behind minute atoms of colour. Opaque white has been applied in the same manner to create infinitesimal highlights on the apex of the Rigi; sometimes the same technique is used on semi wet paint.

Stipples, hatchings and fragmented touches of colour are painted in transparent, semi transparent and opaque consistency, the latter especially drybrushed to produce crisp, sharp details. Their mark-making range in broad terms is between 0000 to no. 2 brush size or 2H – 4B pencil lines. Combined with the above techniques, they not only produce contrasts in tone but help create indefinable compounds of colour.

The final touches consist of the deepest colour the paint can produce. In *The Dark Rigi*, Turner has used opaque drybrushed fragments and sweeps of deep Prussian blue to complete his tonal range from light to dark.

The above techniques form a matrix which can be combined as seen fit.

The poetical works of Thomas Campbell

The twenty watercolours Turner produced for Edward Moxon's edition of *The Poetical Works of Thomas Campbell* (published 1837) are today unique among his illustrations in remaining together as a set at The National Gallery of Scotland, Edinburgh and, as part of the conditions of the bequest, many and sometimes all are on display to the public during January only.[6]

They are also unique in that they have received little if any technical analysis until now.

These vignettes, like others Turner produced for engraved series, may by some be dismissed as illustrative and graphic rather than fine art, yet for Turner, such distinctions did not worry his mind.

More intensely dramatic than other series (such as *Rivers, Harbours and Coasts* or *Picturesque Views in England and Wales*), crystallising poetic ideas within a few inches, the techniques they contain, like a mouthful of sea water, will give us a taste of the ocean.

Hamilton (1997:263) comments, "Turner's touch in these little masterpieces is breathtaking in pictorial detail, physical form and narrative atmosphere."
"Concentrated epics" with "intimations of supernatural forces" is how Jan Piggott (1993:114) describes Turner's vignettes, including this series. Hamerton, in his book *The Life of JMW Turner RA* (1879:228, 229), states,

> Of all artists who ever lived, I think it is Turner who treated the vignette most exquisitely and if it were necessary to find some particular reason for this, I should say that it may have been because there was nothing harsh or rigid in his genius, that forms and colours melted into each other tenderly in his dream world, and that his sense of gradation was the most delicate ever possessed by

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[6] For more information on Turner's vignettes, including the Campbell series, see Mungo Campbell, *A Complete Catalogue of Works by Turner in the National Galleries of Scotland* (1993, publisher); Cecilia Powell, "Turner's Vignettes and the making of Roger's Italy", *Turner Studies* (Vol. 3 No. 1 p2-13); Jan Piggott, *Turner's Vignettes* (1993); A Wilton, *The Life and Work of JMW Turner* (1979); Peter Bower, *Turner's Later Papers* (1999:114-120, Tate Publications).

man. If you examine a vignette by Turner round its edges, if you can call them edges, you will perceive how exquisitely the objects come out of nothingness into being, and how cautiously, as a general rule, he will avoid anything like too much materialism in his treatment of them until he gets well towards the centre... Stothard's contributions..., though often graceful and charming, look like patches on the page, and the patches are sometimes awkwardly shaped, whilst Turner's never seem to be shaped or put on the paper at all, but we feel as if a portion of the beautiful white surface had in some wonderful way begun to glow with the light of genius.

The following will help to explain how these exquisite dream worlds were created. Campbell described his own series as being merely "bits of painted pasteboard".[7] In fact, more often than not, it was London board, a thin card made from a laminated ply of two or more papers, sometimes up to eight (often Whatman, but other makes and lesser grades were used as the base sheets) pasted together and pressed.[8] Bristol and Superfine drawing boards were also used by Turner and they all share the same characteristics. London boards appear to have had more care taken during the glazing and finishing process and all were available from colourmen, artist suppliers such as Reeves, Winsor and Newton and James Newman.

These boards have an extremely smooth surface texture (hot pressed) with a minute grain still present, achieved by their placement between two smooth metal plates passed through a set of glazing rolls. This compression of laminated hard sized paper provided a formidable surface to work on which could withstand much abrasion without the surface breaking up. Being far less springy than a single sheet of paper, the board prevented the paint from moving around when applied in crisp, sharp, detailed touches. Combined with their light reflectant properties, the total contributed towards the luminosity of the image.

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[7] M Campbell (1993:53).

[8] One recipe suggests boiling cornflour or starch with a twelfth part of common turpentine, stirred well together and simmered for five to six minutes. Use the paste hot. Cited by Bower (1999:120): Placing the above in a press (bookbinder's will suffice) helps an even adhesion.

Turner appears to have chosen at leisure what and how he would illustrate from the poems.

Preliminary studies for his vignettes, like most of his watercolour experiments, consist of quick loose sketches in pencil and paint to indicate vague ideas for a composition.

Having studied the series in detail at the Study Room of the National Gallery, Edinburgh, I selected *The Brave Roland* (fig. 143) and *Sinai's Thunder* (fig. 144) as examples containing the fullest range of his techniques, though there is little if anything to separate them from others in the series.

The Brave Roland **(see also figs. 145-148)**

The sky and distant mountain are painted with extremely translucent washes and touches of cobalt blue – vermilion is added to the latter in the same density.

In the sky, the minute touches of blue dilute and disperse at the extremities. Already a pattern emerges throughout the series. Turner is never scared to apply such ultra light tints to suggest forms, knowing that once the image has been completed, their translucency will become an invaluable part of the overall effect.

The hill and ruin on the left has a chrome red/vermilion base again of the same density of tone as the above. Cobalt blue is applied on top in slight and successive tints, adding more colour until the deepest tone is achieved. These tints are not always applied flat but are sometimes modelled whilst still wet to express and convey hollows, crags and crevices in the cliff face, not to mention all their highlights and shadows.

The masonry of the walled enclosure has an ultra translucent base tint of yellow ochre, reinforced with blue-grey (cobalt, vermilion and yellow ochre mixed)

Fig. 143

Fig. 144

Fig. 145

Fig. 146

Fig. 147

Fig. 148

of the same density with red-brown embossed reliefs and details. Edges are delineated with crisp, sharp lines of the same colours drybrushed in an opaque tone.

Gradated tints of blue-grey establish the figures and the folds of their habits, with the base white of the board brought into play for highlights. A deeper blue-grey-black makes up many of their heads and slight details.

The ground around the figures is yet another gradated translucent tint of yellow ochre, whilst the shadows cast by them, a mixture of stippled and hatched blue-grey. Straight flat tints of the same echo the deep blue cross.

The armour on the ground in the middle of the figures is a deeper tone of ochre, the shield touched with red; both are outlined with drybrushed blue-grey and shadows. Behind the far wall, three soldiers stand guard with dark red-brown uniforms and light red shields, simply laid in and highlighted with the base of the board.

The river flows with stipples and hatchings of cobalt blue, again gradating in tone from extreme light touches to darker. The small island introduces an emerald greet tint whilst the elongated building and spire, a deeper tone of cobalt with slight touches of red showing through from the undercoat. Deep reflections in the river are of tapering tints of cobalt, whilst the boats and other incidental details are opaque drybrushed touches of the same colour.

Overall, a pattern emerges throughout the series. Each section contains, more often than not, a full range of techniques. Working from lights to darks with gradated tints, touches stipples and hatchings combining and sandwiching opaque with translucent colour, with areas of cutback with the point of a clean, damp brush to create highlights and effects of undertone contrast alongside crisp, sharp drybrushed marks.

Indeed once the preliminary tones and forms are established, their effects are reinforced, strengthened by drawing with the point of an almost dry brush loaded with colour, as if it were a sharp HB/B pencil.

Such sharp marks and deft touches are not only dependent on skill, but (i) the brush must be loaded with the right amount of almost dry paint - wiping it on a cloth or piece of paper will achieve this; (ii) the undercoat must be dry, unless the effect suggests otherwise; (iii) the hard surface facilitates the production of crisp, sharp lines, as they do not absorb or move around.

In sum

The Campbell's series concentrates techniques central to Turner's watercolour practice. The images have all the force and brilliance associated with opaque gouache combined with the translucent character afforded by transparent watercolours.

Crucially the above effects and techniques are difficult, if not impossible, to achieve using solely gum-arabic based paints and cotton-rag-based papers – they will not produce the subtleties of tone found in Turner's watercolours.

However pigments bound with gums arabic, cherry and, in some instances their relatives, with controlled amounts of honey / sugar candy as plasticisers and ox gall as a dispersant, permit a much freer way of working.

Though arabic/cherry gums with the above additives will produce bodycolour/gouache paint, gum tragacanth and its relatives can also be used in combination or as a dominant constituent – though this would produce a more matt, powdery paint and as such does not appear to feature in the *Campbells* series.

These gums share common sugar relatives in their structural composition, particularly arabinose and therefore combine easily. Cherry gum is noted for its

harder, glassier and enamel-like paint films, especially if liquified with arabic, whilst honey and sugar candy help to produce colours which are richer and more intense in tone.

Conclusion

Just as George Stephenson took one of Newcomen's engines apart to see how it worked, here I have done the same with a Turner watercolour.

Mastering small pieces of matter may provide control of the greater picture and just one square inch of a Turner watercolour can conjure the ghosts of the artist, craftsman and colourmen whose practices came together to make the art work.

Herein, for the first time, are the materials he used; what they are, why they work, in what ratios, recipes, formulae and, just as important, what does not work and why.

Not only is this crucial in understanding how Turner achieved his luminous effects and depths of tone that make his work in the medium unique, but it offers an insurance towards the care of his works in the Bequest.

In an age when images like the products of scientific experiments are increasingly viewed as texts, I believe the best way to redress the balance and find out what Turner's watercolours are, is not only to read what others say about them but to attempt to emulate them whilst developing your own style, just as Turner set out to do as a young man faced with Claude Lorrain's masterpieces.

To do this has necessitated historical, empirical and scientific analysis as well as painting, in sum having to learn (i) how to make paper like Turner's, and (ii) how to make paints like Turner's to produce comparative studies and experiments of his watercolours in local and national collections such as *The Dark Rigi* (1842) (fig. 2) and the *Campbells* series (see figs. 143, 144), among others, which have never been studied in such detail before.

The above is supported by Turner's own words on his philosophy of practice in the medium as well as eyewitness and scholarly accounts on the same, which have

never been collated together before. Nor have their omissions been dealt with sufficiently in order to understand the secrets that lay at the heart and in the heat of his practice. They are also set in context with the wider picture of his interests and ideas, the mental and geographical terrain he explored. Genius may chart its own course but sociability can provide the atmosphere for its cultivation; it did for Turner.

Meeting other artists, natural philosophers, poets, academics and so on, whether at the Royal Academy, Royal Society, the Athenaeum Club or in private gatherings, the opportunities were there.

Here people could move freely and exchange views and knowledge without distinction of religion, class or age.

This struck a balance between an individual becoming locked in their own personal vision or endless chat and boozing that gets you nowhere. Solutions to problems could be discussed and realised.

The effect of tools on Turner's watercolour style had been recognised obliquely in the conversation by two British artists, Opie and Callcott on Girtin in 1805, agreeing, "that painters were as much governed by their tools as their tools were by them seeming to consider that most of the art was dependent on the materials".[1]

During the nineteenth century, practitioners such as Barnard and the critic Ruskin were aware of the role specific papers and paints played on Turner's techniques, as were CF Bell and Finberg in the early twentieth century. More recently, Gage – who cited the above quote – Shanes' research on content, techniques, Townsend on Turner's paints and Bower, Turner's papers, have added their views. However, no one, until now, has painted the full picture.

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[1] Gage 1989:28.

I believe practice is the x of how we learn what Turner's work in the medium is about, not the ten things about x that instructors choose to load the student with. In Turner's words, they "are neither one or the other to him until he prove to himself that they are so".[2] In theory, there is no difference between theory and practice, but in practice there is.

A Turner watercolour such as *The Dark Rigi* (1842) (fig. 2) or *Norham Castle* (1823) (figs. 3 and 4) more often than not constitutes a luminous communion of materials, ideas and techniques.

Here not only do we learn about the interdependency between artist, papermaker and colourmen to make the art work, we also learn why their innovations do not exist today – chiefly due to commercial pressures – and just as important, how to go about doing something about it.

In order to make paper like Turner's, I set about resolving difficulties which had defeated many others involved in making handmade, linen rag-based, gelatine-sized paper during the last thirty years or so. Chiefly these difficulties are finding worn linen rags free from OBAs (Optical Brightening Agents) and other contaminants, beating the pulp, forming the sheet, pressing, sizing, drying, glazing and finishing it to early nineteenth century practices.

This project, in collaboration with John Gerard (Papermaker) and the advice of Peter Bower (Paper Historian, Forensic Analyst), is graphically illustrated step-by-step in both words and images. Using both handmade and advanced technology – the Electron Scanning Microscope – the aim has been to replicate the best in the papers Turner used.

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[2] TS Vol. 2 No. 1 p39.

We can see and learn about the differences between the papers Turner used and those available today, how they set limits to what can and cannot be done in the watercolour medium and what steps were taken to narrow the gap and match the best in Turner's papers. We also learn how and why the handmade papermaker is highly dependent on natural processes and external conditions for his craft. For example, the rotting and preparation of rags for pulping, monitoring the temperature of the pulp, its feel and texture in the beater, the influence of the papermaker's attitude when forming the sheet, the temperature when drying and sizing the sheet – cool misty mornings being preferred – all have a direct bearing on the paper's technical performance in the watercolour medium.

Turner never seems to lose touch with the surface texture of the paper, using it as an integral part of the image. However, the realisation that his watercolour masterpiece, *The Dark Rigi* (1842) (fig. 2) is more about how the paint works upon paint rather than the effect of light reflected from the paper's surface through the paint films, necessitated detailed experiments with watercolour paints, pigments, gum binders, additives and colourmen's recipes. Here we learn how to make paints Turner used.

The detailed experiments supported by comparative studies of Turner watercolours help to (i) illustrate the differences between the watercolour paints/binders Turner used and those available now; and (ii) the difference between a textural effect in the paint film due to the interaction of paint media, gum and paper or a spontaneous/evolved technique by the artist; (iii) how different ratios and combinations of gums and additives affect their adhesive and soluble characteristics and performance in practice.

Some concluding experiments can be seen in nos. 158-175; their precise recipe contents are listed near the end of Chapter VII in the section 'Making watercolour paints like Turner's'.

Nos. 158-159 Modern Winsor and Newton and Rowney watercolour paints – detail of *The Dark Rigi* (1842) (fig. 2).

Nos. 160-162 Arabic, honey / sugar candy, ox gall preparations based upon late eighteenth and early nineteenth century colourmen recipes as well as my own experiments – details of *The Dark Rigi*.

Nos. 163-165 Cherry gum / arabic / senegal gum, honey / sugar candy, ox gall preparations.

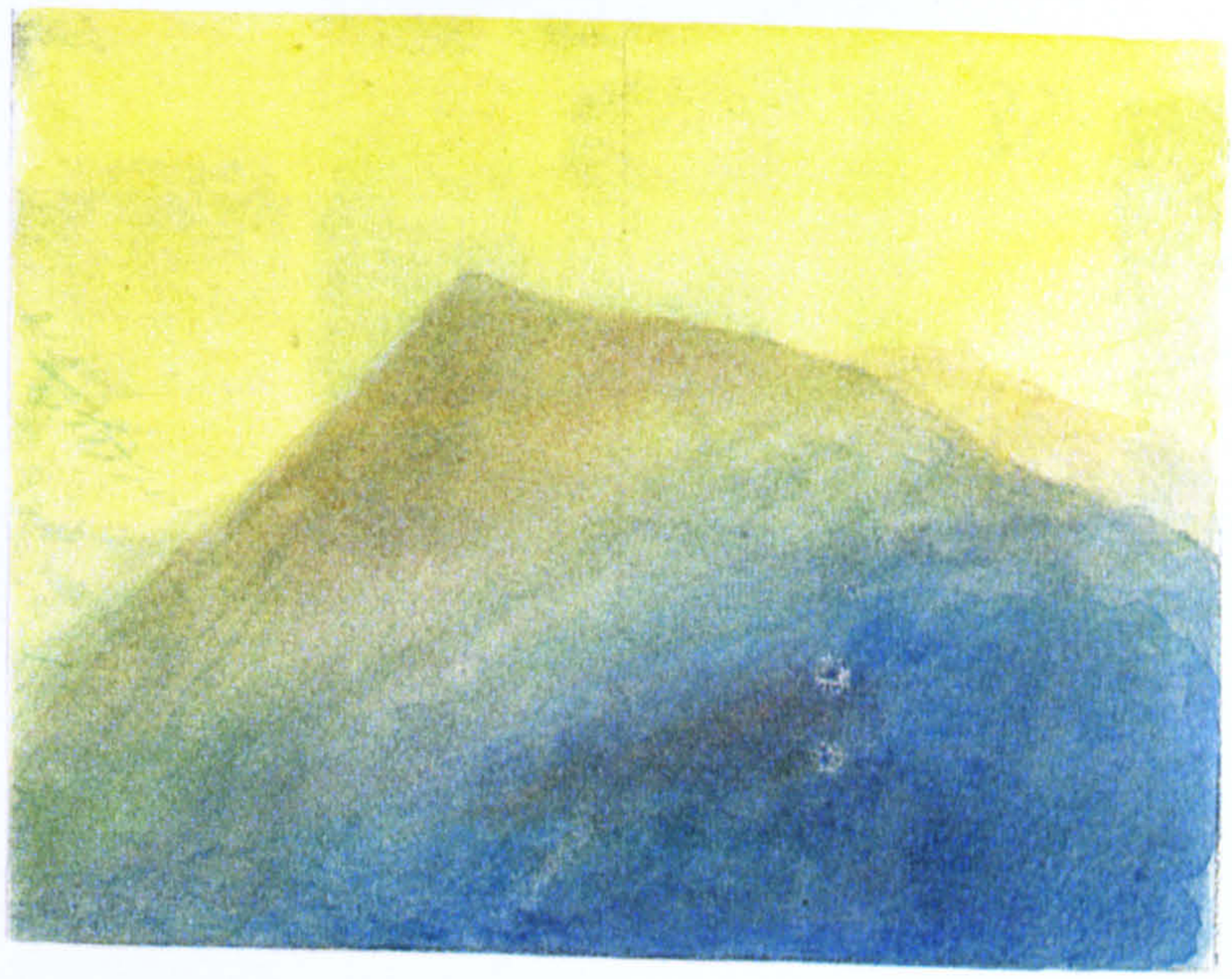
Nos. 166-167 Gums tragacanth, cherry, arabic, senegal and honey / sugar candy, ox gall preparation.

Nos. 168-172 Cherry gum, arabic, senegal and honey / sugar candy, ox gall preparations – details of *The Dark Rigi*.

Nos.173-175 A refinement of the previous experiment.

GCMS analysis of Turner paint samples, nineteenth century watercolour cakes, pure gums and my own experiments has proved helpful in identifying the

158



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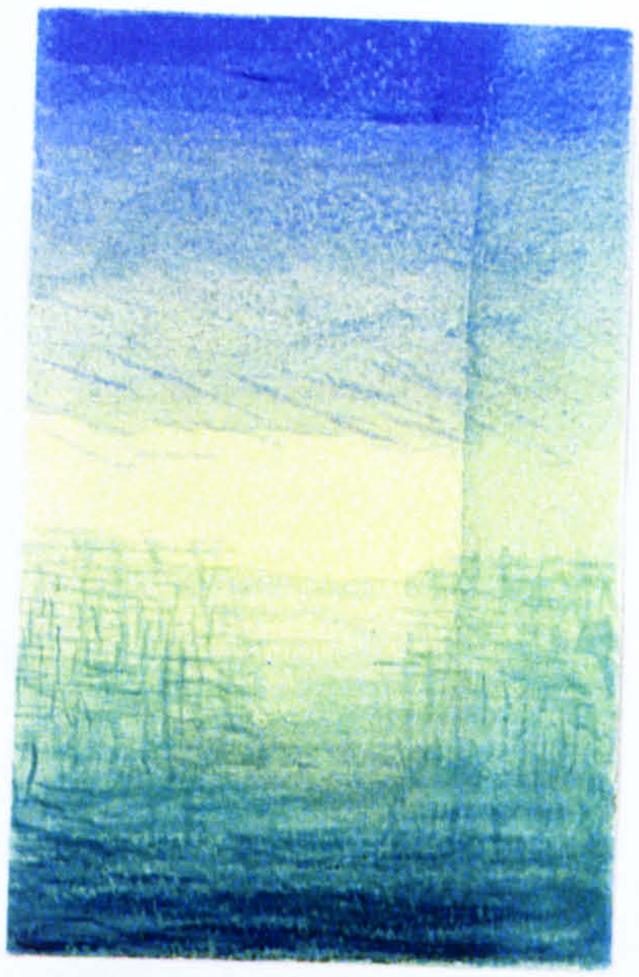

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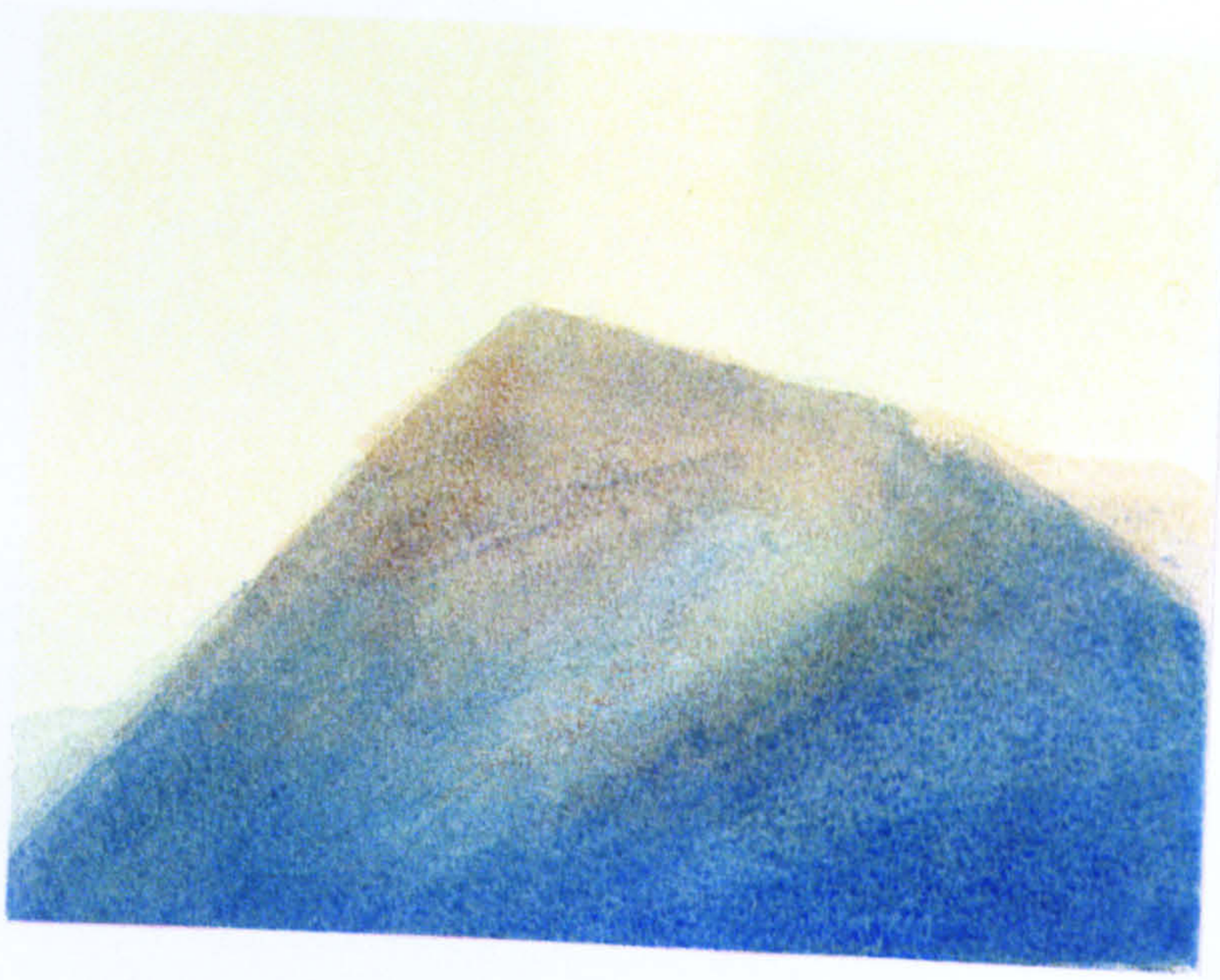
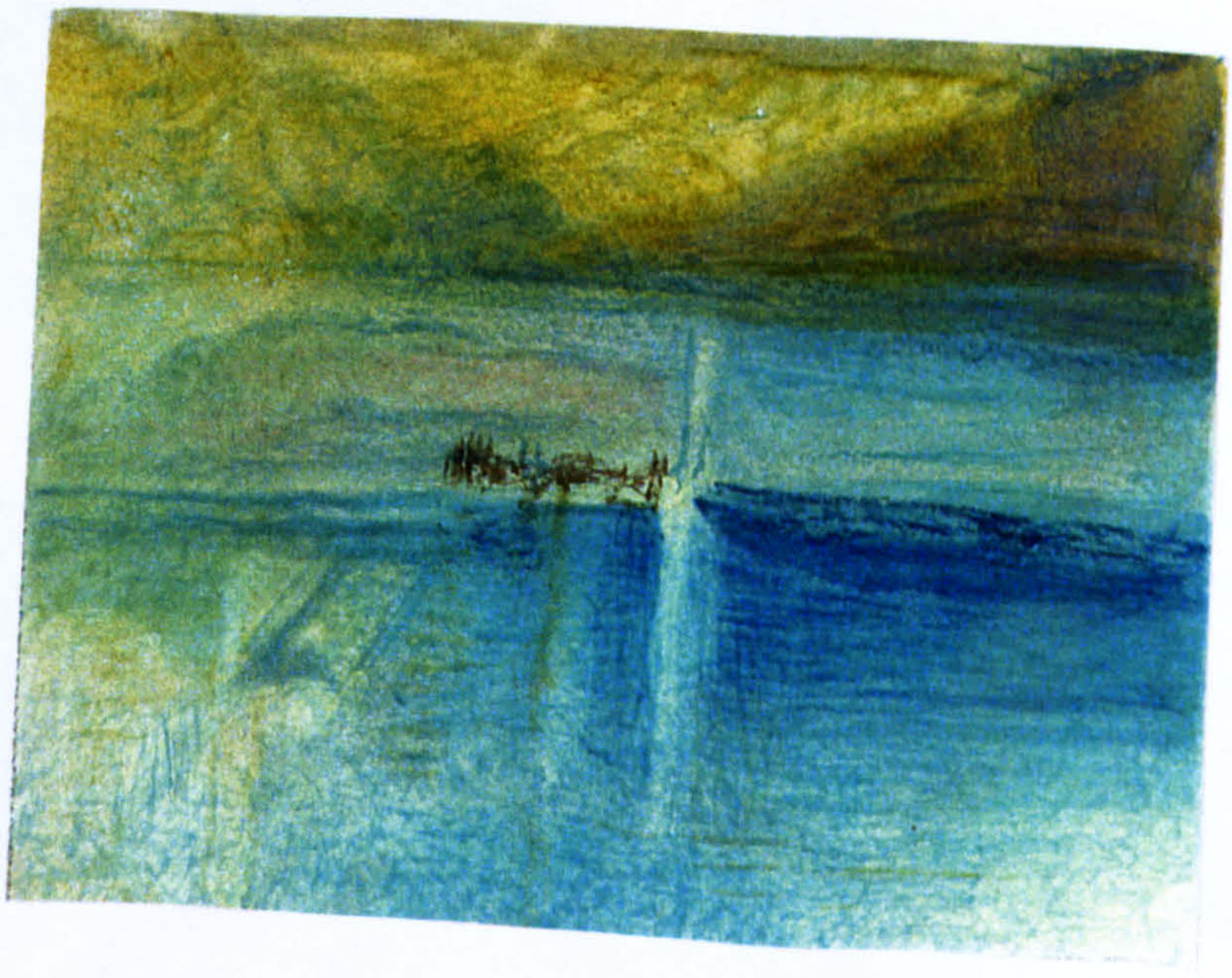
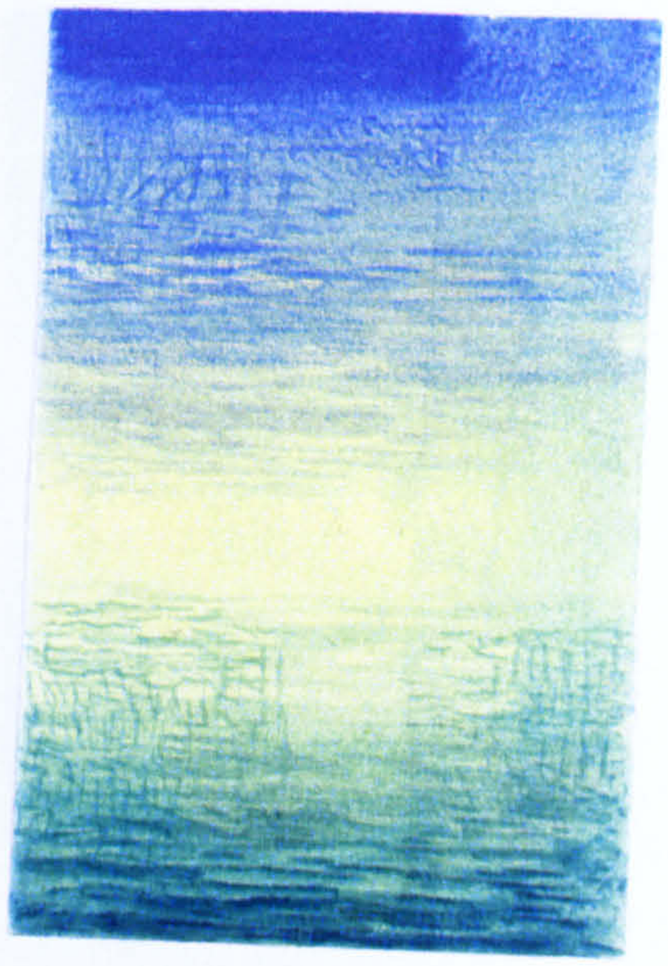


162

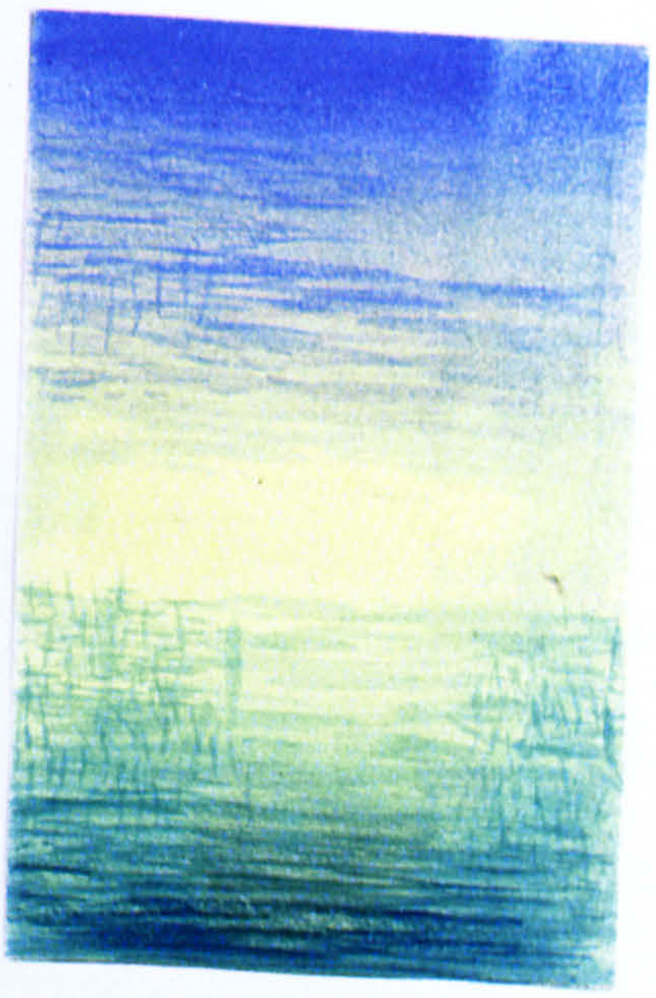


163



164

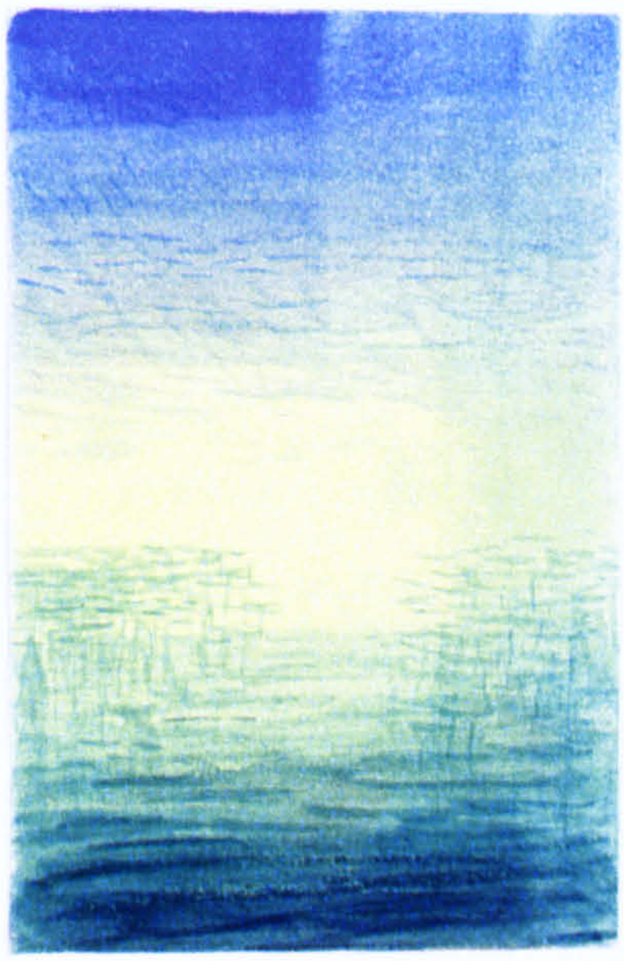
165



166

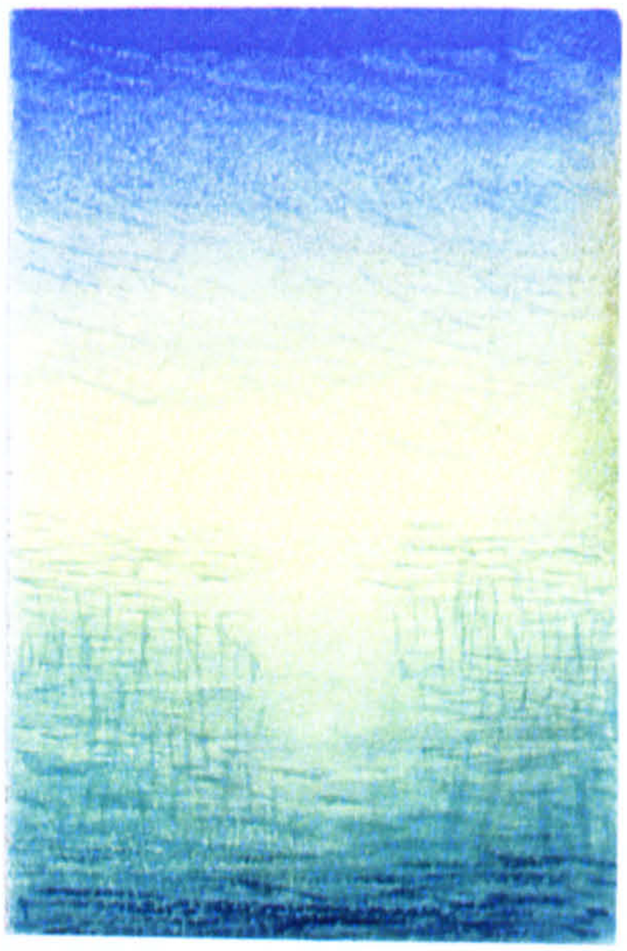
167

168

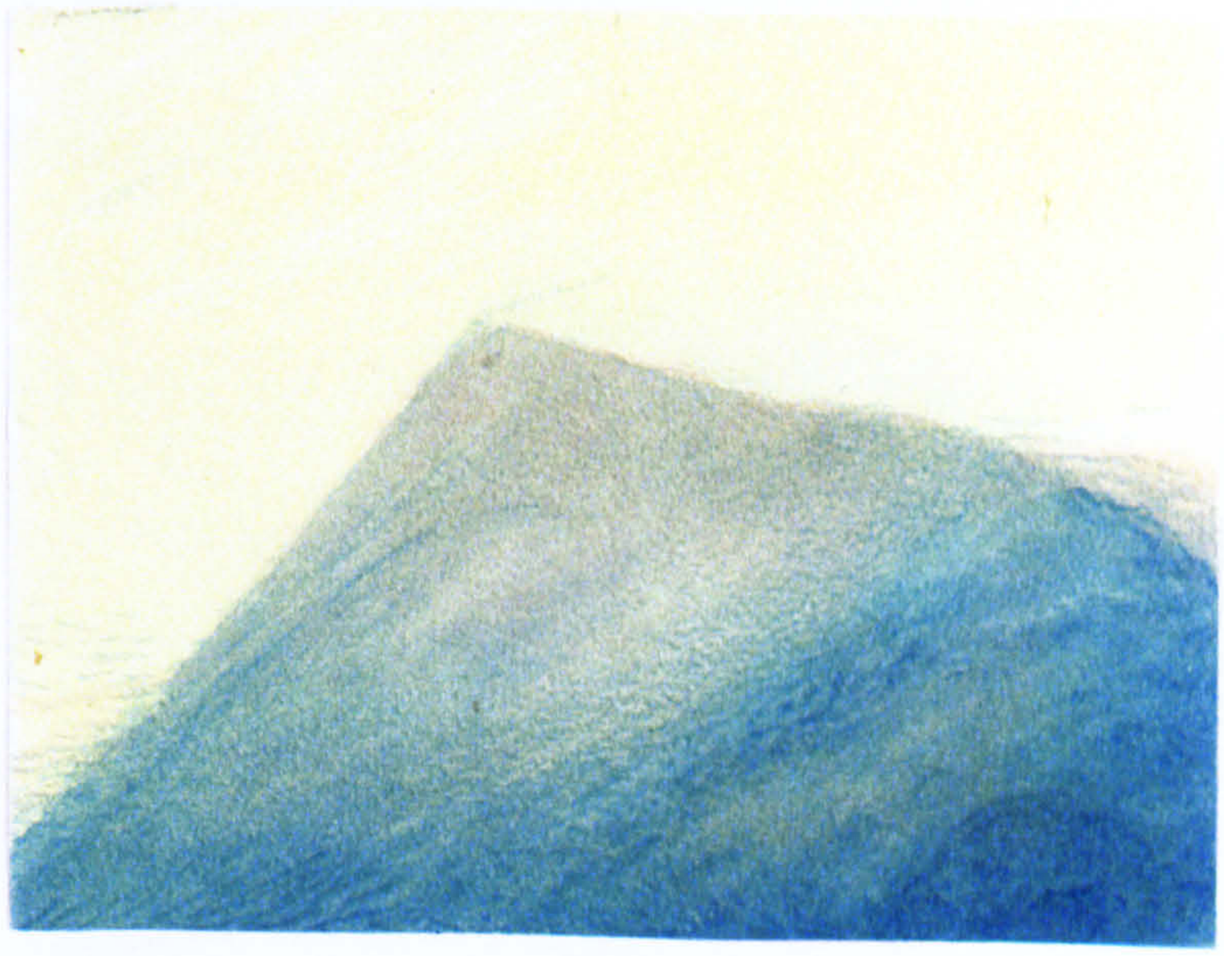


169

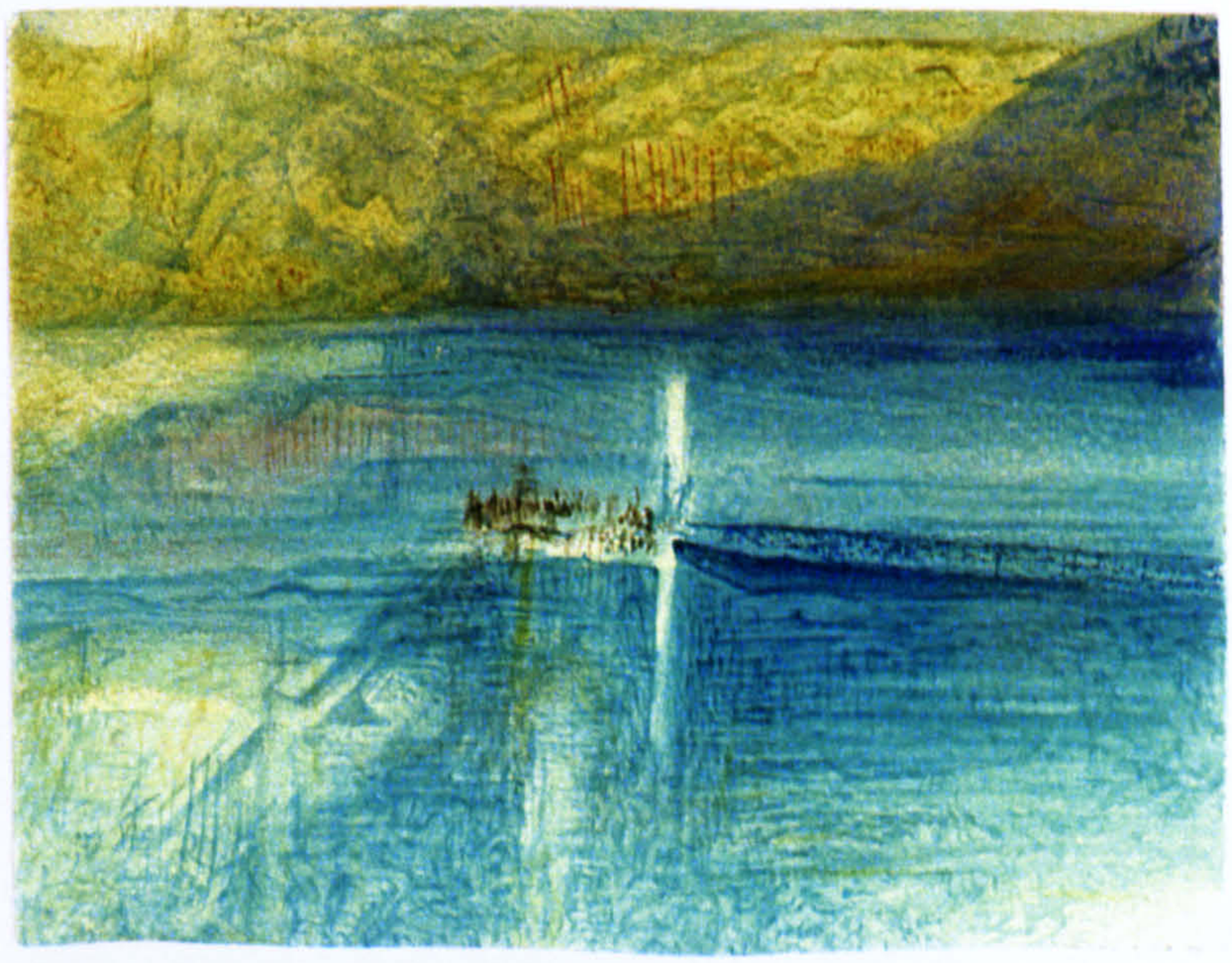
170



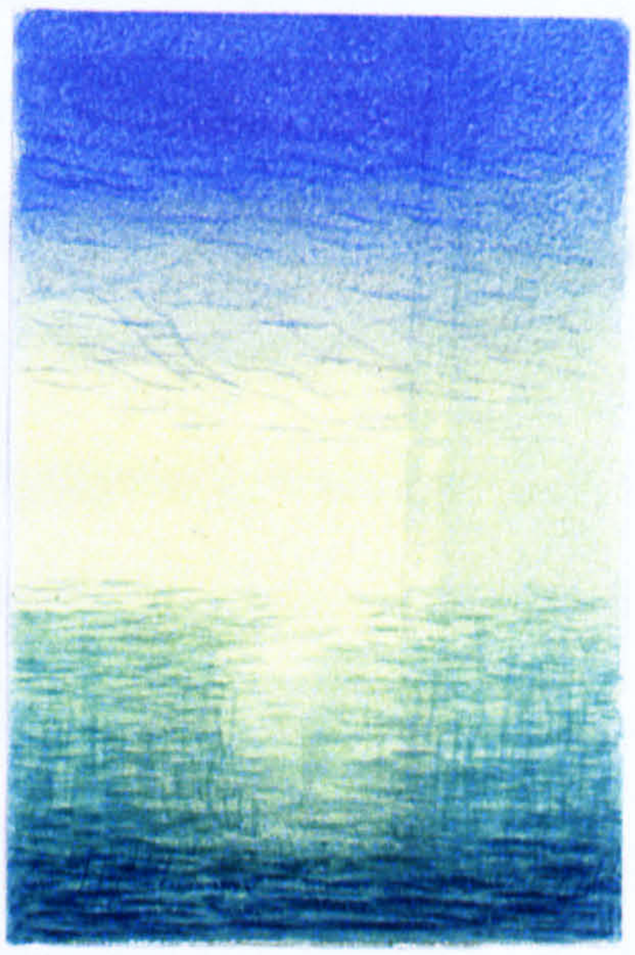
171



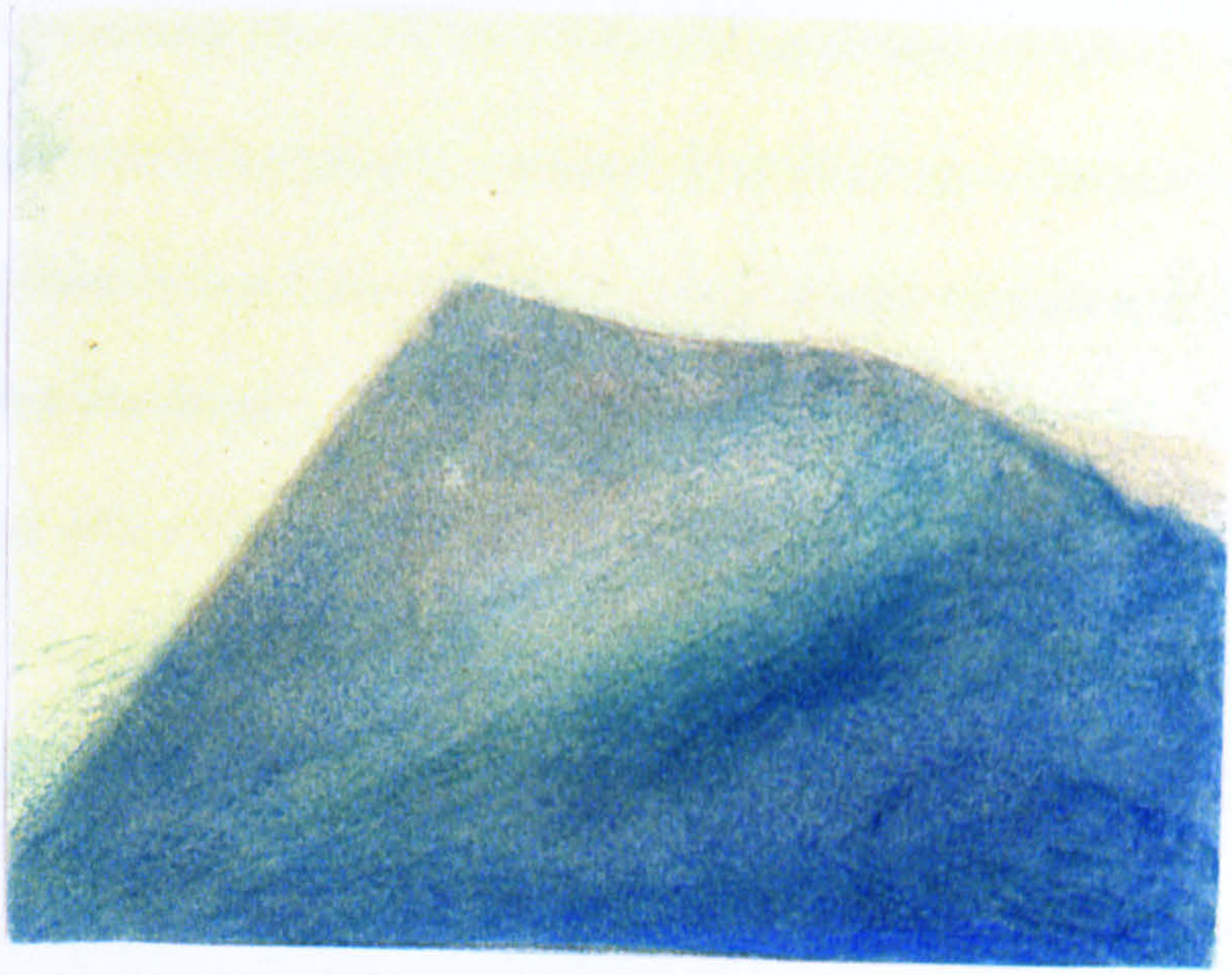
172



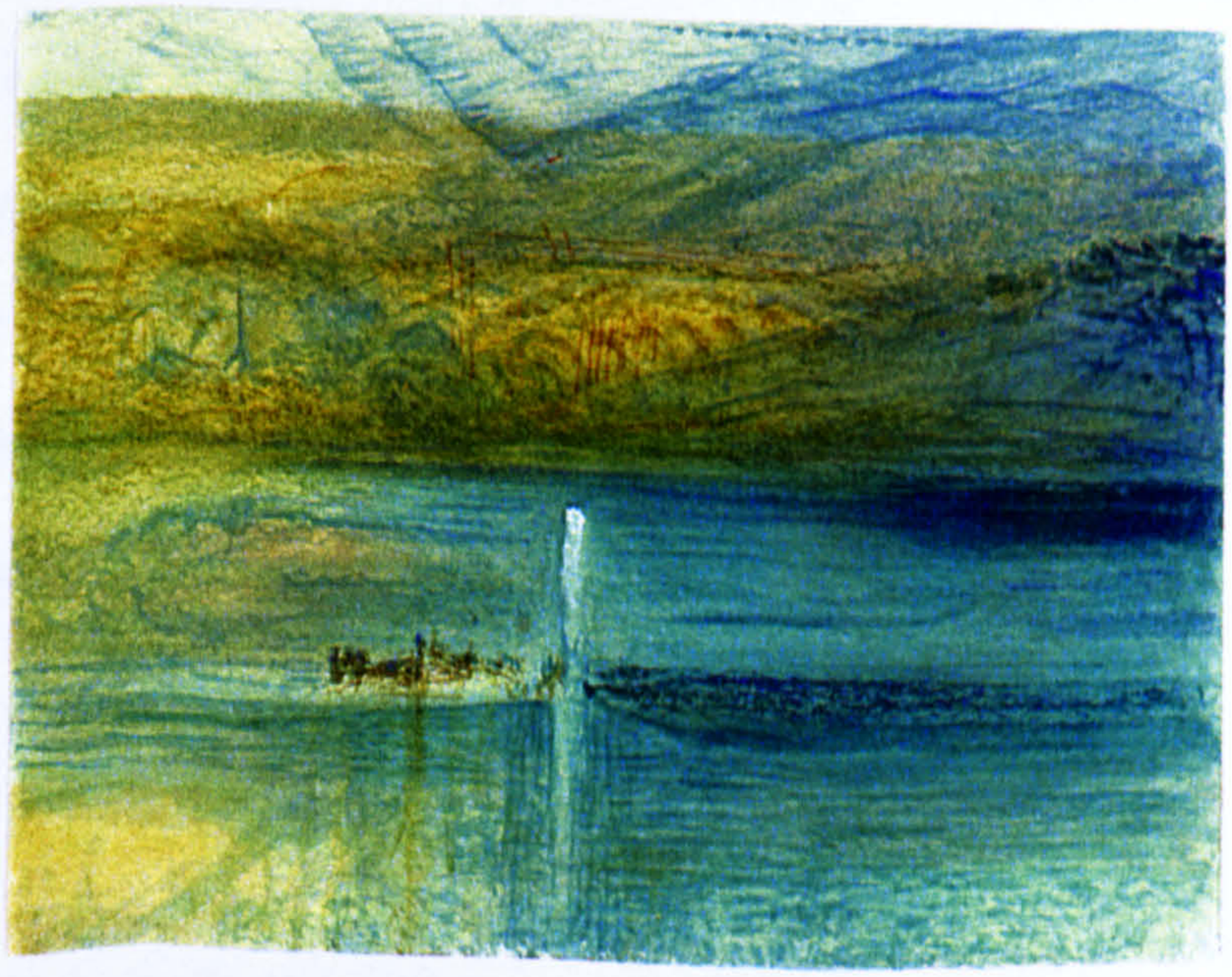
173



174



175



shared and absent sugar components in a range of gums, particularly arabic, senegal, cherry, tragacanth, karaya and sarcocolla.

However, like many advanced technologies it is semi quantative, only working to known set standards. GCMS does not always provide definite answers to which gums are present in the sample, especially when they contain a mixture of gums and additives such as sugar and honey. With many gums sharing similar sugar components, overlap and misidentification can easily occur. The effects of ageing, temperature and how the sample is treated prior to and during analysis can all have a bearing on the results, though methods are continually developing. Graphs do not paint pictures, nor tell us how the gums perform in practice. Here we learn to appreciate the limits of analysis – whether it be critical or technologically advanced – and the benefits that can be gleaned by combining different activities and disciplines. The direct comparison by eye between painted samples/experiments and areas of the art work has proved invaluable.

Turner was well aware of the limits a solely critical approach to knowledge could have, how it can restrict the available options for new approaches to a problem, citing 'the splendid Theory of Art' as an example. He condemned too the tendency by many instructors to view a work of art as a product of tuition rather than the artist's own interests. Although Turner absorbed ideas on colour theory, science and perspective, more often than not it all went out the window during practice. The old masters were to be employed as models for emulation and their methods and materials subject for experiment and rediscovery – but not at the expense of the novice developing their own style and originality. This delicate balance could only be achieved through trial and error and unceasing practice. Only then could the novice discover what suited their style or not. In addition, he advised both novice and

professional alike to extend and test their self-found knowledge through studying nature in all her complexities, rather than become embroiled in the labyrinthine contraries of the critic, connoisseur or patron.

Turner, like Shelley and Faraday, among others of his age, viewed nature as something dynamic not static, where one form of energy could convert into another. This was both a development and realisation of Newton's ideas set out in the Queries to his Opticks (c1704), particularly Quests 30 and 31, for example, "The Changing of Bodies into Light and Light into Bodies is very comformable to the course of Nature, which seems delighted with Transmutations". Using light as a transmuting medium, Turner dissolved and recombined elements and ideas in vaporous tints, tones and opacities, producing pictorial depths and effects that reverberate like Faraday's fields of force suffusing nature. The particles of paint became a world in itself. The microtonal no-man's-land that exists between colours in the spectrum, the indefinable tones found in aerial and terrestrial phenomena, became fused with the artists own palette and choice of colour harmony on paper.

It is these instabilities that enable the viewer to read what they will into the composition. Here there is a resonance with Goethe's belief that nature's transmutations are mimicked by the creative process and the unconscious processing of information. For just as the earth's topography could shift gradually, eroding over time, or suddenly, due to elemental changes, storms floods and so on, Turner altered topographical details and the lie of the land in the instantaneous flicker of a pencil sketch or whilst driving wet paint around the paper until he had expressed the idea in mind. And, if stuck for inspiration whilst out sketching in the landscape, you had only to turn the corner and you had what you needed – a bland view could inspire an epic scene or vice versa. Likewise, what nature could not supply, the imagination could. In

Goethean terms, it became nature's equal and moved like a dream in the night to deal the deadliest blows to rationalism and mundeity.

Turner did not have to visit Carthage as he sketched epic scenes on the Thames, nor witness Hannibal crossing the Alps, or perceive a first rate taking in stores as their genesis evolved in the middle of Yorkshire at Walter Fawkes' home.

As Hardie (1967 vol III p108) stated, "Turner swerved off all the tracks he had established dazzling and irritating his contemporaries. All through his long life he was experimenting, adjusting, altering, probing new possibilities for watercolour without any consciousness of his ultimate objective".

Picasso, sixty years earlier, echoed much the same: "Research is a waste of time. I'm accused of many terrible things and the worst is having a theory. You just have to stumble across what you are looking for." (c1907)

List of Illustrations

Figure

1 JMW Turner, *Dover from Shakespeare's Cliff*, 1825 (watercolour) 15.9 x 24.1 cm (George C White Esq.); Shanes 1981, plate 46.

2 JMW Turner, *The Dark Rigi*, 1842 (watercolour, bodycolour) 30.5 x 45.5 cm (The Nivison Loan to the Laing Art Gallery, Newcastle Upon Tyne); Wilton and Lyles 1993, plate 263.

3 JMW Turner, *Norham Castle on the Tweed*, circa 1823 (watercolour) 15.6 x 21.6 cm, Clore Gallery, London; Gage 1987, plate 120.

4 Detail of ibid.

5 JMW Turner, *The Blue Rigi*, circa 1842 (watercolour, bodycolour) 24.1 x 30.9 cm, private collection; Lloyds, Joll, Conyleare, Turner 1996, plate cat. no. 89.

6 Details of ibid.

7 JMW Turner, *Florence*, 1827 (watercolour, bodycolour) $11^{1/4}$ x $16^{1/2}$ inches, Lloyd Bequest, British Museum, London; Powell 1987, plate 17.

8 Detail of ibid.

9 JMW Turner, *Lake Albano*, circa 1828 (watercolour, bodycolour) $11^{1/2}$ x $16^{1/2}$ inches, private collection; HL Mallalieu 1985, pp 38 and 29.

10 Detail of ibid.

11 JMW Turner, *Lake Nemi*, circa 1840 (watercolour, bodycolour) $13^{5/8}$ x $20^{1/4}$ inches, Lloyd Bequest, British Museum, London; Powell 1987, plate 40.

12 Advertisement for Whatman papers circa 1980s-1990s.

13 JMW Turner, *Mainz and Kastell*, circa 1822 (watercolour, gouache) 20.8 x 36.5 cm, private collection; Shanes 2000, cat. 41.

14 Detail of ibid.

15 JMW Turner, *Thames Sketches*, 1804-1805 (pen, watercolour), Turner Bequest, Clore Gallery, London; Wilton 1987 p 54.

16 JMW Turner, *Durham Cathedral, crossing, nave and north transept from the south transept*, 1797 (pencil) 37 x 27.4 cm, *Tweed and Lakes Sketchbook*, Tate Gallery, London, TB XXXV10; Hills 1997, plate 71.

17 JMW Turner, *Norham Castle, sunrise*, 1798 (watercolour) 50.1 x 70.5 cm, Cecil Higgins Art Gallery, Bedford (W.226); Hills 1997, plate 130.

18 JMW Turner, *Prudhoe Castle, Northumberland*, 1825 (watercolour, bodycolour) 29 x 41 cm, British Museum, London; Shanes 1979, plate 11.

19 JMW Turner, *The Junction of the Severn and the Wye*, 1806 (pen, watercolour) 18.2 x 26 cm, British Museum, London; Forrester 1996, plate 28i.

20 Etching of ibid., pub. 1811.

21 JMW Turner, *East View of the Gothic Abbey (Noon) now building at Fonthill, the seat of W Beckford Esq.*, 1800 (watercolour) 68.5 x 103.5 cm, National Trust for Scotland (Broderick Castle, Isle of Arran; W.338); Gage 1987, fig. 42.

22 JMW Turner, *View from Cook's Folly, looking up the River Avon with Wallis Wall and the Hot Wells*, 1791 (pen, watercolour) 19.7 x 27.3 cm, Clore Gallery, London; Gage 1987, fig. 58.

23 JMW Turner, *Stoke House, Bristol, the Seat of Lady Lippincote*, 1791 (watercolour) 29.9 x 41.2 cm, private collection; Gage 1987, fig. 59.

24 Claude Lorrain, *Landscape with the Arrival of Aeneas at Pallanteum*, 1675 (oil) 175 x 224 cm, Cambridge, Anglesey Abbey, National Trust; Wine 1994, plate 31.

25 Claude Lorrain, *Landscape with the Father of Psyche Sacrificing at the Temple of Apollo*, circa 1662? (oil) 174 x 220 cm, Cambridge, Anglesey Abbey, National Trust; Wine 1994, plate 32.

26 Claude Lorrain, *The Embarkation of St Ursula*, 1641 (oil) 113 x 149 cm, National Gallery, London; Wine 1994, plate 20.

27 Claude Lorrain, *Seaport with the Embarkation of the Queen of Sheba*, 1648 (oil) 148.5 x 194 cm, National Gallery, London; Wine 1994, plate 14.

28 Claude Lorrain, *Study for Coast Scene with the Landing of Aeneas*, circa 1643? (chalk, pen, brown wash, some heightening on reddish tinted paper) 19.2 x 26.7 cm, British Museum, London, no. 007-160; Wine 1994, no. 51.

29 JMW Turner, *The Great Fall of the Riechenbach in the Valley of Hasle, Switzerland*, exhib. 1804 (watercolour, bodycolour) 103 x 70.4 cm, The Trustees of the Cecil Higgins Art Gallery, Bedford; Wilton and Lyles 1993, plate 275.

30 JMW Turner, *The Devil's Bridge, St Gothard*, circa 1814 (watercolour, bodycolour) 106 x 76.2 cm, Yale Center for British Art, Paul Mellon Fund; Shanes 2000, cat. 20.

31 JMW Turner, *Glacier and Source of the Arveron going up to the Mer de Glace*, 1802-1803 (watercolour, bodycolour) 68.5 x 101.5 cm, Yale Center for British Art, Paul Mellon Collection; Wilton and Lyles 1993, plate 278.

32 JMW Turner, *Mont Blanc from Fort Roch, Val d'Aosta*, circa 1814 (watercolour, bodycolour) 69 x 104 cm, private collection; Hills 1992, p 76.

33 JMW Turner, *St Hugh Denouncing Vengeance on the Shepherd of Courmayeur in the Valley of d'Aoust*, 1803 (watercolour, bodycolour) 67.3 x 101 cm, St John Soane's Museum, London; Hills 1992, p 71.

34 JMW Turner, *Trematon Castle, Cornwall*, circa 1825-1828, original watercolour size 28 x 41 cm, whereabouts unknown, engraved 1830 by R Wallis; Shanes1979, plate 98.

35 JMW Turner, *A First-Rate taking in Stores*, 1818 (watercolour) 28.6 x 39.7 cm, Cecil Higgins Museum, Bedford; Gage 1987, fig. 238.

36 Detail of ibid.

37 JMW Turner, *Colchester, Essex*, circa 1825-1826 (watercolour, bodycolour) 28 x 40 cm, Courtauld Institute, London; Shanes 1979, plate 6.

38 JMW Turner, *Funeral of Sir Thomas Lawrence, a sketch from memory*, 1830 (watercolour, bodycolour) 61.6 x 82.5 cm, TB CCLXXII 1-344; Wilton 1987, fig. 189.

39 JMW Turner, *Venice from Fusina*, 1840 (watercolour, bodycolour) 24.4 x 30.4 cm, Tate Gallery, London; Warrell 1997, plate 70.

40 Isaac Newton, illustration which enlarges upon his summary in *Opticks* 1730 Query 14 and a letter to the Royal Society (1675, pub. 1750). See Gage, "Newton and Painting" in *Common Denominators in Art and Science*, 1981, p 20-23, fig. 2.

41 A Miller, *Insights of Genius, Imagery and Creativity in Science and Art*, 1996, p 40, fig. 3, "The interference of water waves in a ripple tank".

42 Lamb and Bourriau, *Colour, Art and Science*, 1997, figs. 10a and 10b, illustrating the interference of light waves in Young's double slit experiment.

43 Michael Faraday, *Magnetic Field Experiment*, 1851, 59.2 x 42.6 cm, Royal Institution of Great Britain; Hamilton 1998, fig. 128.

44 Moses Harris, "Colour Circle, The Natural System of Colours", 1776, taken from *Colour* (ed. Helen Varley), 1980, p 84.

45 George Field, *Chromatography*, 1835, fig. 1; Gage 1989, p 32.

46 JMW Turner, *Colour Circle*, circa 1825 (watercolour) 54 x 74.3 cm, Clore Gallery, London, TB CXCV-179; Gage 1987, fig. 101.

47 From top to bottom: David Brewster's "Production of the spectrum from three primaries", *A Treatise on Optics*, 1831, London; JMW Turner, "The aerial and material colours, as described by Turner", Kemp 1992, fig. 526; and "Weighting of the colours in a wheel, as described by Turner", Kemp 1992, fig. 527.

48 JMW Turner, *Skyscape over Hawksworth Moor, with Colour Notes*, 1816-1818, from *Scarborough II Sketchbook* (pencil) 18.1 x 11.8 cm, TB CLI-18a; D11973; Hamilton 1998, fig. 61.

49 JMW Turner, *Oxford, from North Hinksey*, circa 1834-1840 (watercolour) 35.2 x 51.6 cm, Manchester City Art Gallery, TS vol. 1, no. 2, p 52.

50 Michael "Angelo" Rooker, *The Gatehouse at Battle Abbey, Sussex*, 1792 (watercolour, bodycolour?) 41.9 x 59.6 cm, Royal Academy of Arts, London; Wilton and Lyles 1997, plate 65.

51 Detail of ibid.

52 JMW Turner, *Free transcription of part of MA Rooker's Battle Abbey*, 1792 (watercolour) 17.2 x 14.6 cm, Tate Bequest, XVII-R; Shanes 2000, fig. 3.

53 JMW Turner, *St Anselm's Chapel with part of Thomas-a-Becket's crown, Canterbury Cathedral*, circa 1794 (watercolour) 51.7 x 37.4 cm, The Whitworth Art Gallery, The University of Manchester; Shanes 2000, cat. 4.

54 John Robert Cozens, *Lake Albano and Castel Gandolfo*, circa 1790 (watercolour) 44.1 x 62.2 cm, Leeds City Art Galleries; Wilton and Lyles 1993, plate 33.

55 JMW Turner and Thomas Girtin after J R Cozens, *Lake Nemi, with Genzano*, circa 1796 (pencil, watercolour) 16 x 21 1/4 inches, private collection; Powell 1987, plate 1.

56 JMW Turner, *Vesuvius*, 1819 (pencil, watercolour) 10 x 16 inches, British Museum, London; Powell 1987, plate 14.

57 JMW Turner, *The Rialto*, circa 1840 (watercolour, pencil) 19 x 27.3 cm, Clore Gallery, London, TB CCCXVI-7); Gage 1987, fig. 73.

58 Alerxander Cozens, *Mountain Peaks ('Blot')*, from *A New Method of Assisting the Invention in Drawing Original Compositions of Landscape*, 1785-1786 (etching, aquatint) 23.8 x 32.5 cm, British Museum, London; Wilton and Lyles 1993, fig. 14.

59 JMW Turner, *Preparatory Study for 'Grenoble Bridge'*, circa 1824-1825 (watercolour) 55.5 x 75 cm, TB CCLXIII-346, D 25469; Hills 1992, p 34.

60 JMW Turner, *Grenoble Bridge*, circa 1824-1825 (watercolour, bodycolour, pen, ink) 53 x 73.7 cm, The Baltimore Museum of Art, USA; Hills 1992, p 35.

61 JMW Turner, *The Battle of Fort Rock, Val d'Aoste, Piedmont 1796*, 1815 (watercolour, bodycolour) 69.6 x 101.5 cm, Tate Gallery, London; Shanes 2000, cat. 22.

62 JMW Turner, *Simplon Pass*, after 1841 (watercolour, bodycolour) 38 x 55.2 cm, The Fogg Art Museum of Harvard University, USA; Cohn 1977, plate 6.

63 JMW Turner, *Venice: the Fondamenta Nuova from near the Arsenal*(?), 1819 (watercolour) 23.4 x 29.7 cm, Clore Gallery, London, TB CLXXXI.p.5; Gage 1987, fig. 71.

64 *Stipplings and hatching*, G Barnard, 1858, p 120.

65 JMW Turner, *Rocky Bay with Figures*, circa 1830 (oil) 90.2 x 123.2 cm, Turner Bequest, Clore Gallery, London, B and J, 434, no. 1989; Towsend 1993, fig. 24.

66 JMW Turner, *Crossing the Brook*, 1815 (oil) 193 x 165.1 cm, Turner Collection, Tate Gallery, London; Wilton 1987, fig. 126.

67 John Constable, *The Cornfield*, 1826 (oil) 143.122 cm, National Gallery, London; John Walker, *John Constable*, 1991, plate 29.

68 Author's own attempt at emulating Turner's watercolour *The Dark Rigi* 1842 on 1980s Arches paper, dimensions same as original.

69 Detail of ibid.

70 Thomas Girtin, *Morpeth Bridge*, circa 1802 (pencil, watercolour, pen) 31.4 x 52.7 cm, Laing Art Gallery, Newcastle upon Tyne; Wilton and Lyles 1993, plate 40.

71 Marcus Stone, *Lady Reading by Lamplight*, not dated, circa 1890-1910? (watercolour) 26.3 x 17 cm, Shipley Art Gallery, Newcastle Upon Tyne.

72 Miles Birkett Foster, *Entrance to the Grand Canal, Venice*, circa 1868 (watercolour, bodycolour) 26 x 38.8 cm, Sunderland City Museum Art Gallery (author's photograph).

73 A transmitted light image of the watermark to a Whatman paper 1822, used by Turner to paint *Ehrenbreitstein*, 1841 (watercolour) 24.2 x 30.2, TB CCCLXIV-319, D36177; Bower 1999, plate 40A.

74 Laid papermaking mould and deckle; Bower 1990, fig. 1 and 1A.

75 Wove cover of Whatman papermaking mould; R Hills 1988, fig. 13.

76 "The Hollander Beater", Vince Studley, *The Art and Craft of Handmade Paper*, 1977, p 51.

77 *Mr Bramah's Hydrostatic Press*, 1812 (steel engraving) 26.3 x 20.2 cm, from *Abraham Rees' Cyclopaedia or Universal Dictionary of Arts, Sciences and Literature*, London 1820; Bower 1999, fig. 7.

78 JMW Turner, *Venice: The Arsenal*, circa 1840 (watercolour, bodycolour?) 25.3 x 31.7 cm, Clore Gallery, London, TB CCCXVI-27; Gage 1987, fig. 75.

79 Papermaking machine, anon; Bower 1990, fig. 20.

80 Papermaker John Gerard forming sheet of paper, personal communication 1997.

81 Papermaking mould and deckle; Studley 1977, p 49.

82 John Gerard couching a sheet of paper, ibid.

83 John Gerard separating a sheet after wet pressing, ibid.

84 The vat crew drying unsized paper, drying sized paper flat, part of the handmade paper production at Springfield Mill, Maidstone, Kent in 1906; Bower, *The Quarterly*, July 1991, p 10, courtesy of Whatman Ltd.

85 Three surfaced of white drawing paper, handmade: rough, NOT and hot pressed; John Krill, *English Artists Paper* 1987, fig. 36.

86 Letter to author from papermaker John Gerard.

87 JMW Turner, *Passage of Mont Cenis*, 1820 (watercolour, bodycolour) 29.2 x 40 cm, Birmingham Museums and Art Gallery; Shanes 2000, cat. 54.

88 Joyce H Townsend, 'Turner's pigment use in works on paper, in five year periods', from "The Materials of JMW Turner: Pigments", *Studies in Conservation*, 38, 1993, table 4.

89 Pigment grinding, colour mill and apparatus, engraved for the *Encyclopaedia Londinensis*, 1824.

90 JMW Turner, *Between Quilleboeuf and Villequier*, circa 1832 (pen, bodycolour on blue paper) 14 x 19.1 cm, Clore Gallery, London, TB CCLIX-104); Gage 1987, fig. 88.

91 Isaac Smiths, *Midshipman on Captain Cook's HMS Endeavour and Master's Mate on HMS Resolution*, 1772-1775, Reeves watercolour box; Goodwin, *Artist and Colourman*, 1966, opposite p 28.

92 The leather jacket of an almanac used as a watercolour cake carrying case by JMW Turner; M Clarke, *Eyewitness Art Watercolour*, 1993, p 37.

93 Initial results of gas chromatograph mass spectrometry analysis of Reeves watercolour cakes circa 1791-1800, from Museum of London; Bronwyn Ormsby, August 2000, Northumbria University, personal communication.

94 Rudolf Ackermann, *A Treatise on Ackermann's Superfine Watercolours with instructions on how to prepare and use them*, 1801, pp 13-20, London.

95 A travelling watercolour box made by JMW Turner; Whitley, "Relics of Turner", *The Connoisseur Magazine*, LXXXVIII, 1931, p 198.

96 Watercolour pigments (suppliers indicated) bound with gum ratios and additives specified by R Ackermann's 1801 superfine watercolour paint recipes; also includes several modern Winsor and Newton paints for comparison, painted by author.

97 JMW Turner, *St Erasmus in Bishop Islip's Chapel, Westminster Abbey*, 1796 (watercolour) 54.6 x 39.8 cm, The Trustees of the British Museum (1958-7-12-402) as part of the RW Lloyd Bequest; Shanes 2000, fig. 11.

98 JMW Turner, *Distant View of London, with St Paul's*, circa 1797, *The Wilson Sketchbook* (watercolour, bodycolour on toned paper) 12.4 x 18.7 cm, Clore Gallery, London, TB XXXVII pp 56-57; Gage 1987, fig. 145.

99 JMW Turner, *Marxbourg and Brugberg on the Rhine*, 1820 (watercolour, bodycolour) 29.1 x 45.8 cm, British Museum, London; Shanes 2000, fig. 4.

100 JMW Turner, *Dido Building Carthage, or the Rise of the Carthaginian Empire*, RA 1815 (oil) 155.5 x 232 cm, National Gallery, London; Lloyd, Joll, Conybeare, Turner 1996, p 21.

101 JMW Turner, *Mont Pilatus from Lake Lucerne*, circa 1844 (watercolour, bodycolour) 24.4 x 30.9 cm, TB CCCLXIV-314, D36201; Warrell 1995, plate 36.

102 Author's own watercolour study using 50% tragacanth, 50% karaya gum binder.

103 Author's own experimental watercolour composition using 75% tragacanth, 15% karaya, 10% arabic as pigment binders.

104 B Ormsby, "A table of GCMS gum analysis of Turner watercolour paint samples", Department of Chemical and Life Sciences, University of Northumbria, Newcastle, personal communication 24 February 2000.

105 B Ormsby, "A table of results comparison - Vallance and Ormsby - of relative abundance of sugars in gums", ibid., personal communication December 1999.

106 B Ormsby, GCMS analysis of black watercolour paint taken from one of Turner's palettes, ibid., personal communication 6 December 1999.

107 B Ormsby, GCMS analysis of dark ochre watercolour paint (gouache, bodycolour) sample from Turner's *Venice from Fusina* 1840 (see fig. 39), ibid., 6 July 2000.

108 B Ormsby, GCMS analysis of dark brown watercolour paint (gouache, bodycolour) sample taken from Turner's *Funeral of Sir Thomas Lawrence* 1830 (see fig. 38), ibid., 6 July 2000.

109 B Ormsby, GCMS analysis of yellow paint (gouache, bodycolour) taken from above work, ibid., 5 July 2000.

110 B Ormsby, GCMS analysis of Prussian blue paint (gouache, bodycolour) taken from above work, ibid., 6 July 2000.

111 B Ormsby, GCMS analysis of black paint (gouache, bodycolour) taken from above work, ibid., 6 July 2000.

112 B Ormsby, GCMS analysis of gum arabic (new), ibid., 23 June 1999.

113 B Ormsby, GCMS analysis of gum cherry almond (new) from AP Fitzpatrick, London, ibid., 19 March 2000.

114 B Ormsby, GCMS analysis of gum tragacanth (new) from Kremer, ibid., 10 August 1999.

115 B Ormsby, GCMS analysis of sarcocolla gum resin (new) from Nazareth, Israel, ibid., 24 February 2000.

116 B Ormsby, GCMS analysis of author's own gum mixture: 35% arabic, 35% karaya, 10-15% almond gum, 10% tragacanth, 5-10% sarcocolla, ibid., 5 August 2000.

117 B Ormsby, GCMS analysis of author's own gum mixture: 35% arabic, 35% karaya, 10% cherry almond gum, 5% tragacanth, 15% sarcocolla, ibid., 25 July 2000.

118 B Ormsby, GCMS analysis of author's own gum mixture: 35% arabic, 35% karaya, 10% cherry almond gum, 10% tragacanth, 10% sarcocolla, ibid., 26 July 2000.

119 B Ormsby, GCMS analysis of author's own gum mixture: 50% arabic, 50% cherry almond gum, ibid., 22 August 2000.

120 B Ormsby, GCMS analysis of author's own gum mixture: 30% tragacanth, 30% karaya, 20% arabic, 20% cherry almond gum and trace sugar, ibid., 5 September 2000.

121 B Ormsby, GCMS analysis of author's own gum mixture: 70% tragacanth, 15% arabic, 15% cherry almond gum, ibid., 21 August 2000.

122 Author's own experimental watercolour composition using pure cherry gum (Aubenas) as a pigment binder.

123 Author's own experimental watercolour composition using arabic as a binder (trace sugar candy) with small amounts of lead and zinc white added to transparent paint on palette and in the water vessel until diluted to a milky consistency.

124 Author's own experimental watercolour/gouache composition using 30% tragacanth, 30% karaya, 20% cherry almond gum, 20% arabic as a pigment binder.

125 JMW Turner, *Whitby*, circa 1825 (watercolour) 15.9 x 24.8 cm, private collection; Shanes 1981, plate 48.

126 JMW Turner, *Dartmouth Castle on the River Dart*, 1822 (watercolour) 15.9 x 22.4 cm, Turner Bequest; Shanes 1981, plate 54.

127 JMW Turner, *Scene in the Tyrol*, circa 1843 (watercolour, gouache, bodycolour) 24.3 x 31 cm, TB CCCLXIV-361; Warrell 1995, plate 71.

128 JMW Turner, *Martigny*, circa 1841-1842 (pencil, watercolour, pen) 22.9 x 29.1 cm, TB CCCXXXII-23, D33493; Warrell 1995, plate 98.

129 JMW Turner, *The Village of Fluelen*, circa 1844-1845 (watercolour) 24.4 x 30.5 cm, TB CCCLXIV-282, D36133; Warrell 1995, plate 37.

130 JMW Turner, *Arth*, circa 1842-1843 (pencil, watercolour) 22.8 x 29 cm, TB CCCLXIV-280, D36129; Warrell 1995, plate 28.

131 JMW Turner, *Ehrenbreitstein*, 1841 (watercolour, bodycolour?, pen) 25 x 31.5 cm, TB CCCLXIV-285, D36138; Warrell 1995, plate 7.

132 JMW Turner, *Arundel Castle with Rainbow*, circa 1824 (watercolour) 15.9 x 23 cm, Turner Bequest; Shanes 1981, plate 64.

133 JMW Turner, *Dartmouth on the River Dart*, 1822 (watercolour) 15.7 x 22.7 cm, Turner Bequest; Shanes 1981, plate 56.

134 JMW Turner, *Shields on the River Tyne*, 1823 (watercolour) 15.4 x 21.6 cm, Turner Bequest; Shanes 1981, plate 49.

135 JMW Turner, *Kirkstall Lock on the River Aire*, 1824-1825 (watercolour) 16 x 23.5 cm, Turner Bequest; Shanes 1981, plate 61.

136 JMW Turner, (top) *Norham Castle*, 1797 (pencil) 21 x 27 cm, British Museum, XXXIV-57); (bottom) *Norham Castle* 1801 (pencil) 16.5 x 22.8 cm, British Museum, London (LIII 44a and 45); Luke Herman, *Turner*, 1975, plates 184 and 185, Phaidon Press.

137 JMW Turner, *The Red Rigi*, 1842 (watercolour, bodycolour?) 30.5 x 45.8 cm, National Gallery of Victoria, Melbourne Felton Bequest, 1947; Lloyd, Joll, Conybeare, Turner 1996, cat. no. 88.

138 JMW Turner, *The Rigi at Dawn*, sample study for *The Dark Rigi* 1842 (watercolour, bodycolour?) 23.1 x 32.2 cm, TB CCCLXIV-279, D36127; Warrell 1995, p late 31.

139 JMW Turner, *The Rigi at Sunset, The Red Rigi* sample study 1842 (watercolour, bodycolour?) 22.8 x 30.2 cm, TB CCCLXIV-275, D36123; Warrell 1995, plate 35.

140 Author's own study of JMW Turner's *The Dark Rigi* 1842, painted on Gerard's seventh batch of handmade paper and using paints formulated by experiments and analysis outlined in previous chapter and conclusion; dimensions as original.

141 Detail of ibid.

142 Detail of ibid.

143 JMW Turner, *The Brave Roland*, circa 1836 (watercolour on thin card) 12 x 11.5 cm, National Gallery of Scotland, D5167; Campbell 1993, cat. 54.

144 JMW Turner, *Sinai's Thunder*, circa 1836 (watercolour on thin card) 12.5 x 9.5 cm, National Gallery of Scotland, D5153; Campbell 1993, cat. 43.

145 Author's own study of JMW Turner's *The Brave Roland* circa 1836 on Gerard's seventh batch of handmade paper and using paints formulated by experiments and analysis outlined in previous chapter and conclusion; dimensions same as original.

146 Detail of ibid.

147 Author's own study of JMW Turner's *Sinai's Thunder* circa 1836, as ibid.

148 Detail of ibid.

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